

H.R. 4260—REAUTHORIZATION OF THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT

HEARINGS

BEFORE THE
SUBCOMMITTEE ON GENERAL OVERSIGHT
AND THE ECONOMY
OF THE
COMMITTEE ON SMALL BUSINESS
HOUSE OF REPRESENTATIVES
NINETY-NINTH CONGRESS
SECOND SESSION

WASHINGTON, DC, MAY 8, 13, AND 15, 1986

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H.R. 4260—REAUTHORIZATION OF THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT

THURSDAY, MAY 8, 1986

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON GENERAL OVERSIGHT
AND THE ECONOMY,
COMMITTEE ON SMALL BUSINESS,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:10 a.m., in room 2359-A, Rayburn House Office Building, Hon. Nicholas Mavroules (chairman of the subcommittee) presiding.

OPENING STATEMENT OF CHAIRMAN MAVROULES

Mr. MAVROULES. The hearing will now come to order. I certainly want to welcome all of you here this morning. We appreciate your cooperation with our review of the Small Business Innovation Development Act.

I think all of us here are well aware of the history behind this landmark legislation, which awards a small percentage of Government research and development money to fund initial work by small science and technology firms on innovative ideas—ideas that could later produce products for the commercial market, or could contribute further to an agency's internal mission.

In reviewing the evidence that is already in on the achievements of the program, I personally believe the SBIR is a particularly appropriate use of Federal funds.

Not only has this program provided a new opportunity for small businesses to participate in Federal R&D, but the participating agencies have also been able to enhance their ability to meet their own research needs. With enlarged pools of scientific experts from which to draw, these agencies stand to upgrade their own technological progress.

Ultimately, the aim is for high quality scientific and innovative approaches targeted to agency R&D requirements.

During the floor debate of this bill 4 years ago, many of my colleagues expressed grave concern that small businesses could not accomplish research of equal value to that of our universities. I think the experiences of the participating agencies will prove the naysayers wrong.

Furthermore, we included in the final bill a provision for the General Accounting Office to do an evaluation of the program as to the effect of this act on Federal research programs. Last October, this subcommittee held hearings on a GAO report, which was the

first in a series of reports on the nature of research conducted under the act and the agencies' efforts to implement the program. This report evaluated the implementation of the SBIR Act within the first 2 years, and found that the agencies involved had made substantial efforts.

Finally, we provided for a sunset to be attached to the measure, since this was legislation which should be able to prove itself. This sunset clarifies our intent to make sure the program works, or the program will be terminated. Many people have pointed out that 6 years is not long enough for there to be significant commercialization of the R&D projects developed through the SBIR Program. That, in my judgment, is definitely true. But it is long enough to evaluate its potential success.

I think the verdict is in—the agencies are excited about the quality of the proposals they have received and about the potential benefits to be derived from these proposals. This is clearly a program that must be extended. Its value already has been proven.

Congress often moves slowly. For that reason, I believe that we must begin to consider reauthorization now—to ensure that there is no gap in its implementation, and to send the participating agencies and interested small businesses a message that we want this important program to continue.

To that end, I, along with my colleagues, Messrs. Bedell, LaFalce, Conte, and McDade, introduced a bill to repeal the sunset provision of Public Law 97-219. These hearings will help us in our consideration of this measure, and our decision to eventually reauthorize the Small Business Innovation Development Act.

Before we go on to our first witness, I would ask my colleague from Virginia, Mr. Olin, if he has any remarks.

OPENING STATEMENT OF HON. JIM OLIN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF VIRGINIA

Mr. OLIN. Thank you, Mr. Chairman.

I certainly would like to congratulate you for having this hearing. It is very timely and it will be important for our considerations. I hope that all of the people who are testifying will be totally candid with us with regard to this subject.

It is a program which we have mandated—we have been pushing it to give small business a little extra opportunity to participate in R&D.

I am not really skeptical about it except that I know that some people have felt that it is a little unnatural. I think it is quite appropriate that we look objectively at what the results have been and to be sure that we are not attempting to do something here that may not be realizing all of the potential that we thought it had and end up wasting a lot of money.

So I am quite open minded on the subject. I haven't quite reached the same conclusion that the chairman has reached, but that is all right. I will be listening closely and reading. I won't be able to be here for the entire hearing but I will be looking at what you have to say in the written record. I would urge you to be just as candid and straightforward as you can be. If you are critical, so be it. If you are not, that is even better.

Mr. MAVROULES. Thank you, Jim.

Mr. OLIN. Thank you, Mr. Chairman.

Mr. MAVROULES. I assure you I am going to keep working on you, so we will be in agreement by the time this thing comes around for a vote.

We have three witnesses here this morning. Our first witness is Mr. Richard J. Green, Assistant Director for Scientific, Technological and International Affairs, National Science Foundation. Welcome, Mr. Green, if you will proceed.

TESTIMONY OF RICHARD J. GREEN, ASSISTANT DIRECTOR, SCIENTIFIC, TECHNOLOGICAL, AND INTERNATIONAL AFFAIRS, NATIONAL SCIENCE FOUNDATION, ACCOMPANIED BY DONALD SENICH, DIVISION DIRECTOR, INDUSTRIAL PROGRAMS, RITCHIE CORYELL, PROGRAM MANAGER, AND ROLAND TIBBETTS

Mr. GREEN. Thank you, Mr. Chairman. I have a detailed, prepared statement and with your permission I would like to highlight it.

Mr. MAVROULES. Without objection, the entire statement will be included in the record.

Mr. GREEN. If I may, Mr. Chairman, I would like to introduce my colleagues who do all the work on the Small Business Program.

Mr. MAVROULES. Of course.

Mr. GREEN. Dr. Donald Senich, who is the Division Director of the Industrial Science and Technological Innovation Program; Mr. Ritchie Coryell, who is a program manager for SBIR, and Mr. Roland Tibbetts who, I am proud to say, he and I worked together in the early days to develop the SBIR Program.

Mr. MAVROULES. I would be happy to invite them all to sit at the table with you if they would like.

Mr. GREEN. Yes, please.

Mr. MAVROULES. Come on up, gentlemen.

We can ask you the tough questions. That is why you brought them along, isn't it? [Laughter.]

Mr. GREEN. Mr. Chairman, small high technology firms represent an important national resource to the United States. They have strong research capabilities and serve to accelerate technological innovation. They represent one of the best avenues for converting fundamental research into applications for the economic and social well-being of our country.

NSF is proud of its role in the original design and early experimentation which led in part, at least, to the development of the Small Business Innovation Development Act of 1982. The NSF Program is carried out in three phases: phase 1 explores the feasibility of the proposed concept; phase 2 is the principal research effort; and phase 3 is the product development and commercialization stage.

The SBIR Program provides a major opportunity for science and technology-based small firms to participate in NSF sponsored research. It enables them to propose long-term, high-risk creative ideas that could only be pursued with outside support.

In addition, NSF SBIR awards provide the basis which has helped the firms attract private investment, obtain other R&D

awards, and develop working relationships and arrangements with large industrial firms, venture capital investors, universities, and with State and local governments.

The Small Business Innovation Research Program was developed at NSF in fiscal year 1977 when Congress directed the Foundation to award about \$1 million of applied research funds to small businesses. The NSF Program will grow to a level of \$17.1 million in fiscal year 1987. Since the initiation of the SBIR Program at NSF in 1977, we have invested \$47.6 million of Federal funds in the highest quality research proposals received under the SBIR Program solicitations.

The Foundation has issued eight solicitations—1977, and 1979 through 1985. These solicitations generated a total of more than 5,800 phase 1 proposals, from which we have made a total of 686 phase 1 awards and 216 phase 2 awards.

Since 1977, small firms, in 42 States and the District of Columbia, have participated in the program.

Mr. Chairman, the competition for awards is not just high, it is intense. Usually we are dollar limited in the number of awards we make. Typically, we can only fund 50 percent of the phase 1 proposals recommended for award. This attests to the high quality of the proposals and the capability of the high technology firms in the competition.

The NSF solicitation was designed to assure the quality of awards made to small business firms and to provide incentives for the conversion of federally sponsored research into technological innovation in the private sector. The major intent of the program is to increase the economic benefits to the country from Government research. Basically, our intention is to move Government research results into the private sector.

The NSF SBIR Program is designed to encourage small high technology firms to submit research proposals on advanced concepts that are consistent with the scientific and engineering objectives of the Foundation.

The 1986 solicitation, which allows firms to compete in all research areas generally supported by the NSF. Additional emphasis in this solicitation is given to stimulate high quality research in four areas of growing national importance: biotechnology, scientific instrumentation, supercomputing, and manufacturing systems.

Proposers are asked to consider whether the research has commercial potential. If it does, we give additional consideration in evaluating the proposal. Additional consideration is given to those who have contingent commitments for non-Federal follow-on funding from the private sector. This will allow them to pursue development of the commercial potential after Government funding ends. We fund phases 1 and 2. Phase 3 is funded by private sources of funds.

The essence here is that non-Federal funds pay for development, that is, to bring the service or product to the marketplace.

The commitment for follow-on capital is obtained from a party of the proposer's choice. The commitment is normally contingent upon the research achieving certain technical objectives mutually agreed upon between the small business and the provider of the follow-on capital.

In fiscal years 1984 and 1985, 40 out of 53, and 60 out of 64 phase 2 awards had follow-on funding commitments.

During the first 4 years of the program in NSF, \$18 million of Federal funds expended were matched by private sector follow-on funding for phase 3, amounting to \$150 million. This is a leveraging factor of 8 to 1 of private sector to Federal funds. We are very proud of this accomplishment.

The SBIR Program is working very well at the Foundation. SBIR was designed to provide extra value to the national economy from the R&D funds expended with small firms.

We believe that SBIR firms may do better than other performers of Federal R&D in terms of economic value received. This is due to the unique entrepreneurial and innovative capabilities of small high-technology firms which conduct R&D at lower cost.

The extremely competitive nature of the program as well as the built-in incentive to utilize the Government research as a base for high risk ideas and follow-on private sector investment also contribute to its effectiveness. We believe the experiment is over. The results are in—the NSF Program is a success.

Now, there are a few comments I have to make here concerning enhancing the program administration. While the program has been a success at the Foundation, we believe it could be improved if we were allowed to use a limited amount of SBIR research funds for administration of the program. Additional resources are needed to pay for: First, the printing and mailing costs of our solicitations; second, the costs of developing an outreach effort to foster and encourage greater participation by minorities and women in technological innovation; third, costs associated with peer review panels to review the proposals. These panels provide our program officers with the critical advice and input to technically evaluate the broad spectrum of proposals; and, fourth, the cost of supporting two highly important and successful annual high-technology conferences which bring together in a central location the potential high-technology researchers with SBIR managers of all the participating Federal agencies, representatives of major prime contractors, venture capital firms, and State and local government representatives. These expenditures amount to somewhere between \$150,000 to \$200,000 per year.

Incidentally, the Federal High Technology 1986 Conferences in Dallas and Boston last year attracted a total of 1,500 attendees from small companies, big business, the investment community, academia, and Federal, State and local governments. Twenty-eight major prime contractors—companies like IBM, AT&T, Raytheon and Boeing sent representatives to meet with small firms in search of new technologies and sources for subcontracting and supply.

Sixteen States presented their R&D opportunities to small businesses for high technology development and industrial renewal.

These annual conferences have clearly emerged as a principal gathering place for responsible communities which share a vital stake in our Nation's progress in high technology.

By the way, the leading spokesmen for high technology from the U.S. Congress have consistently participated in these conferences over the last 10 years. We are very pleased that the chairman spoke at our Boston meeting last December.

In conclusion, SBIR is funding cutting edge research in key technology areas important to the economy. It is an opportunity for researchers with high risk ideas from small firms with strong R&D capabilities to work effectively with universities, industries and venture capital firms to promote the economic competitiveness and technological innovation that for so long has been the backbone of our industrial capabilities.

Thank you, Mr. Chairman. I would be pleased to respond to any questions which the members of the committee might have.

Mr. MAVROULES. Thank you very much, Mr. Green. I appreciate your very candid testimony here this morning.

[Mr. Green's prepared statement follows:]

PREPARED STATEMENT OF RICHARD J. GREEN,
ASSISTANT DIRECTOR, SCIENTIFIC, TECH-
NOLOGICAL, AND INTERNATIONAL AFFAIRS,
NATIONAL SCIENCE FOUNDATION

Introduction

Small high technology firms represent an important national resource to the United States. They have strong research capabilities and serve to accelerate technological innovation. They represent one of the best avenues for converting fundamental research into applications for the economic and social well being of our country.

NSF Role in Development of the SBIR Program

We are proud of the original design and early experimental role of the National Science Foundation which led to the passage of the Small Business Innovation Development Act of 1982, P.L. 97-219 and expanded to other agencies. The program is carried out in three phases: Phase I explores the feasibility of the proposed concept; Phase II is the principal research effort; and Phase III is the product development and commercialization stage.

The SBIR program provides a major opportunity for science and technology-based small firms to participate in NSF sponsored research. It enables them to propose long term, high risk creative ideas that could only be pursued with outside support. In addition, NSF SBIR awards provide the basis which has helped the firms attract private investment, obtain other R&D awards, and develop working arrangements with large industrial firms, venture capital investors, universities, and with State and local governments.

The Small Business Innovation Research program was developed at NSF in Fiscal Year 1977 when Congress directed the NSF to award about \$1 million of applied research funds to small business firms. The program will grow to a level of \$17.1 million in Fiscal Year 1987 due to the requirements of P.L. 97-219. The legislation prescribes that 1.25 percent of the Foundation's current extramural research budget be reserved for SBIR awards to small business concerns through a uniform process of review and

management. Since the initiation of the SBIR program at NSF in Fiscal Year 1977, NSF has invested \$47.6 million of Federal funds in the highest quality research proposals received under the SBIR Program Solicitations.

NSF has issued eight SBIR program solicitations--1977, and 1979 through 1985. These solicitations generated a total of 5,821 Phase I proposals from which we have made a total of 684 Phase I awards and 146 Phase II awards, as shown in the attached table. Since 1977 small firms in 42 states and the District of Columbia have participated in the NSF program. Mr. Chairman, the competition for awards is not just high - it is intense. Usually, we are dollar limited in the number of awards we make. Typically, we can only fund 50% of the Phase I proposals recommended for award. This attests to the high quality of the proposals and to the capability of the high tech firms in the competition.

Current SBIR Activity at NSF

The SBIR program expenditures for Fiscal Years 1984 and 1985 were \$7.1 million and \$12.4 million based on NSF's estimated extramural research budgets of \$1,089 million and \$1,247 million respectively. In Fiscal Year 1984, the NSF made 102 Phase I awards out of 1185 proposals submitted. In Fiscal Year 1984, NSF made 53 Phase II awards, which included 34 new awards and 19 continuing grant actions. These Phase II awards were drawn from 81 proposals received under previous solicitations.

In Fiscal Year 1985, the Foundation made 105 Phase I awards out of 977 proposals submitted. In Fiscal Year 1985, NSF made 64 Phase II awards, which included 33 new awards and 31 continuing grant actions.

NSF SBIR Solicitation Design

The NSF solicitation was designed to assure the quality of awards made to small business firms and to provide incentives for the conversion of Federally sponsored research into technological innovation in the private sector to increase the economic benefits from government research. SBIR research can serve as both a technical and pre-venture capital base for ideas which, in addition to meeting Government needs, have commercial potential.

The NSF SBIR solicitation permits small high tech firms to submit research proposals on advanced concepts that are consistent with the scientific and engineering objectives of the Foundation. The current 1986 solicitation contains topics from all of NSF's 22 disciplinary research divisions and allows small firms to compete in all research areas generally supported by the NSF. Additional emphasis in this solicitation is given to stimulate high quality research in four areas of growing national importance: biotechnology, scientific instrumentation, supercomputing, and manufacturing systems.

Proposers are asked to consider whether the research proposed on NSF program objectives also has commercial potential. If their research has such potential, additional consideration in evaluating the Phase II proposal is given for proposers that provide contingent commitments for non-federal, follow-on funding from a third party, preferably in the private sector. This allows them to pursue further development of the commercial potential after the Government funding is completed in Phases I and II. Non-Federal funding pays for development - that is, the activity to bring the product or service to the market place.

NSF Experience with Follow-on Funding Commitments

The commitment for follow-on capital or other funding is obtained from a party of the proposer's choice. The commitment is normally contingent upon the research achieving certain technical objectives mutually agreed upon between the small business and the provider of the follow-on capital.

At NSF, the commitments to date have taken the form of venture capital, licensing agreements, contract R&D, joint ventures, R&D limited partnerships, and other arrangements. Our SBIR Program Officers work closely with the firms to maximize the conversion of the science developed in the research effort into technology.

NSF places considerable emphasis on obtaining follow-on funding commitments to provide strong incentives for the conversion of our SBIR research into technological innovation and commercial applications as was intended in the design of the legislation. Commitments from the private sector are obtained for most Phase II awards and this policy has had striking results. Projects funded during the first four years of the NSF program have resulted in \$150 million of private follow-on funding compared to \$18 million of NSF expenditure. We believe that this 8 to 1 leveraging factor will continue as more projects mature and the large number of follow-on commitments obtained begin taking effect.

Significant Examples of Converting Government and University Bioscience into Industrial Pay-offs

o In 1977, NSF funded a Phase I proposal from Collaborative Research, Inc. in Waltham, MA for the first genetics research carried out by the company. NSF made awards of \$25,000 in Phase I and a \$239,000 in Phase II to conduct research on Enhancement of Animal Protein Production by Novel Genetic Technology. Dow Chemical invested \$11.5 million in the SBIR firm. Collaborative Research, Inc. had 33 people at the time of the Phase I award and relatively old facilities. Today, the firm has 135 employees and large new laboratories in Lexington, MA. It has also gone through two very successful public offerings and is a leader in the biotechnology field. It has raised over \$40 million based on the initial genetics research conducted under

the 1977 NSF SBIR award. More recently the company was the first to identify the genetic marker for cystic fibrosis. Nobel laureate Dr. David Baltimore is chairman of the company's scientific advisory committee.

o Native Plants, Inc. of Salt Lake City, UT received a Phase I award for research on a Mycorrhizal Inoculated Containerized Plant Growing System in 1980. The Company had 40 employees and received a \$30,000 Phase I and related \$200,000 Phase II award. It had an initial Phase III commitment of an equal amount from a Chicago based venture capital firm--F.H. Prince and Company. The research was highly successful and \$1 million of private funds were invested in the project. This and other SBIR awards helped the company obtain an additional \$39 million of private investment in the form of seven R&D limited partnerships and investments by five large industrial firms. The company now has 250 employees, outstanding new laboratories in a research park adjacent to the University of Utah campus, and is a world leader in the field of plant genetics.

o Verax Corporation of Hanover, NH received a Phase I award of \$35,000 in 1982 for research on Long-life Catalysts for Immobilized Microorganism Fermentors. Four Dartmouth professors in biochemistry, biophysics, microbiology, and chemical engineering were involved as consultants. Early work was carried out in Dartmouth laboratories leased by Verax using students as part-time employees. The Phase I research was very successful and the fermentation process has been speeded up by a factor of 10 as a result. Verax then obtained a follow-on funding commitment and already has received more than \$3.5 million in new investment. It also has a new laboratory, is working closely with MIT as well as Dartmouth and Rutgers scientists and is already selling products to major biological and pharmaceutical firms. Verax grew quickly from four to 110 employees and spun-off two separately financed scientific instrument firms, one in biotechnology and the other in medical instrumentation. These spin-offs are direct by-products of the NSF and NIH SBIR projects. Verax now has 75 employees after the two spin-offs.

Federal High Tech Conference

In order to facilitate the interaction between SBIR awardees and potential providers of follow-on funding, NSF and other Federal agencies have sponsored a series of Federal High Tech Conferences. The Federal High Tech '86 conferences in Dallas and Boston last year attracted a total of 1500 attendees from small companies, big business, the investment community, academia, and Federal, state, and local governments. Twenty-eight major prime contractors, companies like IBM, AT&T, Raytheon, and Boeing, sent representatives to meet with small firms in search of new technologies and sources for subcontracting and supply. Sixteen (16) states presented their R&D opportunities to small business for high technology development and industrial renewal.

These annual conferences have clearly emerged as the principal gathering place for the responsible communities which share a vital stake in the Nation's progress in high technology. NSF is pleased to continue its role in sponsoring this unique forum. Leading spokesmen for high technology from the U.S. Congress have consistently participated in these conferences over the last 10 years, most notably the generous appearance of Mr. Mavroules last December at the Boston event.

Program Assessment

SBIR is working well at NSF. The examples represent only a few of the many successful collaborations between the Federal Government, small high tech firms, universities, large industrial and venture capital firms. We are convinced the program is working as intended. SBIR was designed to provide extra value to the National economy from the large Federal presence in R&D. We believe that SBIR firms may do better than other performers of Federal R&D in terms of economic value received due to the unique entrepreneurial and innovative capabilities of small high tech firms which also conduct R&D at lower cost. The extremely competitive nature of the program as well as the built-in incentive to utilize the Government research as a base for high risk ideas and follow-on private sector investment also contribute to its effectiveness. We believe the experiment is over. The results are in - the NSF program is a success.

Conclusion

SBIR is funding cutting-edge research in key technology areas important to the economy that in many instances only the Government can support. It is an opportunity for researchers with high-risk ideas from small firms with strong R&D capabilities to work effectively with universities, industry, and venture capital firms to promote the economic competitiveness and technological innovation that for so long has been the backbone of our industrial capabilities.

I would be pleased to respond for the record to any questions which the members of the committee might have.

SBIR HISTORY

NUMBER OF PROPOSALS AND AWARDS

	<u>PROPOSALS</u>	<u>PHASE I AWARDS</u>	<u>PHASE II AWARDS</u>
1977	329	42	21
1979	408	54	13
1980	530	62	13
1981	696	86	18
1982	764	108	41
1983	1,186	102	(40)
1984	974	105	--
1985	934	125	--
Cumulative	5,821	684	(146)

Mr. MAVROULES. Do you want to articulate on the private public payback ratio that you referred to—about 8 to 1?

Mr. GREEN. Yes; we have another study—

Mr. MAVROULES. How do you determine that?

Mr. GREEN. We have actually gone out and checked with the specific firms as to level of investment by the private sector from the time that our proposal ended—rather, our sponsored work ended—as to where they are today. So, that has been a very accurate figure, and we are trying to go ahead and—

Mr. MAVROULES. The contributions, they get, so I can have it straight in my mind, is that for every \$1 of public funding they receive \$8 in private funding; am I correct?

Mr. GREEN. That is correct—for those firms that have moved into phase 3; yes, sir.

Mr. MAVROULES. That could answer, I believe, a question posed by some of the members of the committee on the payback aspect of SBIR, and whether there should be some sort of a payback schedule. What you have given us is very, very, important testimony because it shows the growth factor. It reminds me a little bit of the UDAG grants where you get \$5 or \$6 for \$1 of Federal funds on a ratio. That is very, very good.

Mr. GREEN. Mr. Chairman, we are trying to update it so we will have that.

Roland, where do we stand relative to our update, to make it more current?

Mr. TIBBETTS. We contacted many of the firms in the first 4 years, but not all—I haven't been able to reach them all. But we will do that, and gradually we will add at successive years as time goes by.

Mr. MAVROULES. Do you think you might be able to give us a report during the next 2 or 3 weeks—an upgraded report?

Mr. TIBBETTS. Yes; I think so. The first 4 years—now, that is the time previous to the law. But it takes time, as you know, to convert research into technology and sales.

Mr. MAVROULES. Let me just ask one question. We are now considering reauthorization to keep the program going and eliminate the sunset, as I mentioned before. In the event that we are not able to do that—I am just taking a worse-case scenario—do you have any programs in mind? Can you fund this kind of a program under your Agency?

Mr. GREEN. Yes; we can do anything, Mr. Chairman. But the law has been a great incentive to get people's attention. I think it has been advantageous for us who are trying to encourage small business to participate to have the law.

Mr. MAVROULES. OK, let me ask just one final question and I will turn it over to my colleagues.

I understand there is a great interest now in the international area.

Mr. GREEN. Yes, sir.

Mr. MAVROULES. Could you articulate on that?

Mr. GREEN. Yes; Great Britain is very interested in it. As a matter of fact, we met with some of the research policy people from the U.K. yesterday, and they are very much concerned about moving things from the laboratories out into the marketplace.

The French have contacted us in this connection and the West Germans. I know that the Japanese will be in touch with us if they haven't been already.

Mr. MAVROULES. How about Holland? I want to get it for the record.

Mr. GREEN. Yes; Roland?

Mr. TIBBETTS. The Dutch have visited us and I have been invited over there. They are conducting a program very similar to ours and that is in process now.

The Irish are doing something that got modified for their needs but it started in a sense with a couple of visits that I also made to Ireland.

English representatives have been over here and spent 10 days. I have been over there. They were set back by the oil problem—but as of last week, authorized a derivative of SBIR.

Mr. MAVROULES. Good. Let me ask another question that just came to mind.

Can you say anything negative about the program? On the one hand we like to hear good things but if there is anything out there that might be troublesome we would like to hear that too.

Mr. GREEN. You are speaking to some of the strongest advocates of the program, Mr. Chairman.

Mr. MAVROULES. I realize that, but I think we are objective too.

Mr. GREEN. I will defer to Don Senich then.

Mr. SENICH. Built into the program, sir, is this move between phase 1 and phase 2.

Mr. MAVROULES. That is right.

Mr. SENICH. It is a down time; we recognize that. That, obviously, makes a difference for a man who has built up capability—there is momentum in there. But that is a building problem that we have made ourselves because—before we buy something, a big number of

something, we want to see if it is going to work. So, in working toward this follow-on funding commitment there is a down time and that, I think, is critical. I think that we should try to work at a system which would allow us to move faster into phase 2. But that is a problem, sir, and I think that that is going to be recognized by the General Accounting Office in their review.

Mr. GREEN. Several of the States, Mr. Chairman, are moving to try to get funds to cover that down time, if you will. But it still is a problem.

Mr. MAVROULES. I agree.

Mr. TIBBETTS. Mr. Chairman, the time between phases 1 and 2, the down time, was designed into the program. I had been out in the private sector and I had seen continual renewal of projects when results were not in. In other words, you are providing the proposal for the follow-on time before you have the results from the previous period. So we designed in that we were going to have a phase 1 and look at results before we put a lot more money into the program.

So the small amount of money, namely, phase 1, was 6 months—the shortest period of time, the smallest amount of money—to determine three things: Is the idea technically feasible? Can the small firm do high quality research? And did they make sufficient progress to justify a larger award in phase 2? That is the primary effort.

Now, there is a second reason for that, and that is the time to get the follow-on funding commitment. Now, we have that time built in. Without that time, I do not believe the firms would be getting follow-on funding commitments. It takes a lot of time to do that and it is important.

I also used to manage R&D and I know that while a small firm may do excellent work, if this is the only work they have, this provides a serious problem. On the other hand, the design was that the small firms would not live off Government R&D, or SBIR. We wanted to pressure them, frankly, to get other work and to not live off the Government, and certainly not to live off this program.

Mr. MAVROULES. Very good.

Mr. Olin.

Mr. OLIN. Thank you, Mr. Chairman.

I am not totally familiar with the work of the National Science Foundation so I would just like to ask a couple of questions about how this thing functions.

Do I understand that you give contracts to lots of people for research, and then to pursue the things you are trying to learn about.

Mr. GREEN. The universities, primarily.

Mr. OLIN. And the sciences you are trying to stimulate. And then this bill requires that some small percentage be—

Mr. GREEN. One and one-quarter percent of our—

Mr. OLIN [continuing]. One and one-quarter percent of the contracts that you give must be to small business.

Mr. GREEN. That is correct, sir.

Mr. OLIN. OK.

I guess the nature of my question is that you said you are getting plenty of action, so you have no shortage of applicants, certainly at

phase 1, and apparently not at phase 2, understanding the gap that is involved. And that you are not able to give out all the contracts you would like to give out. You said you were limited to 50 percent or something like that.

Mr. GREEN. It is actually because of the funding, yes, sir.

Mr. OLIN. I take it these are phase 1 contracts that you are limited on.

Mr. GREEN. Yes; that is right.

Mr. TIBBETTS. Both.

Mr. OLIN. To what extent is this thing paying off for you? In other words, if these relationships are extremely good, as you have said, you are getting very fine people doing the work, why wouldn't you just raise the percentage up on your own if it is paying off for you? What is the limit? I mean, I am not sure I understand that.

Mr. GREEN. Within the Foundation and other agencies, there are a number of priorities that are established as to various research activities. We feel that the proposed \$17 million, for example, in fiscal year 1987 is adequate to cover the need.

What I was trying to point out in the 50 percent funding level, if you will, or funding only half the phase 1's, is the fact that the competition is very intense. But we also have high competition in other programs within the Foundation and typically we are able to fund only one out of every three proposals that we do take and—

Mr. OLIN. But, if I can interrupt you, you said also that these small companies frequently are more competitive, and that they are very ingenious and have low overhead.

Mr. GREEN. I am really referring to that from the standpoint of the competition relative to some of the bigger companies that we have dealt with. We find that they are just a wellspring of ideas, and new thoughts, and new directions. And that it is unfortunate that we can't fund more but we do have other priorities within the Foundation. We are limited in what we can do.

Mr. OLIN. Would you visualize reaching the point as more of these companies graduate to phase 2 and then even phase 3—they are more or less on their own—of that becoming enough of a benefit to the Foundation so that you would just in the natural course of events be giving a larger percentage of your contracts to those firms, in which case the program then will have really succeeded. The seed money put in would have finally generated what we are trying to do—and then it runs itself. Is that conceivable?

Mr. GREEN. We don't see that in sight at the present time, Mr. Olin. Typically our proposal pressure for phase 1 is about—it is somewhere between 900 and 1,000 proposals. By the time we weed out some of those that are really not responsive, we are down to about 500 or 600, and those are the ones that get reviewed. This has continued on over the last 5 or 6 years. We have new firms. We also have some firms that are successful in getting funds for different projects, but they are in a small minority. So we just keep seeing new performers, new proposers springing up on a regular basis. So I have not seen the end in sight.

Mr. OLIN. Are the people that are in phase 2 basically paying their own way?

Mr. GREEN. No; phase 2, we are funding that. If you will, there is a competition among the phase 1 performers, and about one out of

two or three gets funded in a phase 2. That is a Foundation award. The first phase is about \$40,000 from Foundation funds. The second phase is up to about \$200,000.

Mr. OLIN. At what point does the Foundation get some benefit out of this program? How do you benefit?

Mr. GREEN. The benefit comes to the country from the developments that the small firms make, and then the fact then they move into the marketplace. We believe the benefits come back in taxes and new businesses.

Mr. OLIN. You don't ever get a benefit then? Your Foundation—you are acting as an agent to promote this just a generation of research for somebody else?

Mr. GREEN. We sponsor the research but we also take advantage of—I mean, the results are free to be used by Federal agencies. Also, basic patent rights reside with the small business. The results are available generally throughout the Government and free to any agency, or free to any other Federal organization that wants to pick them up. So, we are saying, yes; we are developing new knowledge and new contributions to the fund of knowledge.

Mr. OLIN. I am not sure what the concept was, Mr. Chairman. I would imagine that the concept would have been that the Federal Government somewhere along the way would get some benefit out of this to essentially recover the cost of generating the program. Granted, society in general will get some benefit, maybe. But wasn't the Federal Government also supposed to get some tangible benefit?

Mr. MAVROULES. Let me respond to that, Jim, if I could.

I think that when we talk about a ratio factor of \$8 to \$1 spending, private \$8 and public \$1, the Government is going to be the great beneficiary because we broaden the tax base and we are providing greater opportunities out there through this small business innovation act. By the way, we are not talking about billions and billions of dollars, we are talking about real small money.

Mr. OLIN. I am sure aware of that.

Mr. MAVROULES. By doing that, I think the Government, in the long run, is gaining in technology. I think that is the purpose of SBIR: To enhance and push forward the state of the art.

That is why I asked the payback question before. That is why it is very important that your facts are correct on the public-private investment, because in the long run, the Government will gain by more tax dollars and more people going to work. I am not saying right away, but eventually, it will help to stabilize our economy.

Mr. BEDELL. Will the gentleman yield?

Mr. OLIN. I will certainly yield to the gentleman.

Mr. BEDELL. Isn't the National Science Foundation an effort to promote research that will help to keep our country ahead in civilian research as compared to other countries? Only a small part of your budget is directed toward this particular SBIR Program. That is correct, is it not? And it isn't something that we expect to get money directly back to the Government from?

Mr. GREEN. The total Foundation research budget is about \$1.3 billion. This is \$17 million out of that.

Mr. BEDELL. And that is taxpayers' money that is doing that. And the SBIR Program is a very, very small part of that.

I might mention that my understanding is that between our Government and the Government of Japan, we spend similar amounts in regard to Government research. The difference is that—I think it is 75 percent of ours goes to the military and less than 1 percent of theirs goes to the military. So we are really doing less in terms of commercial research.

Mr. OLIN. Mr. Chairman, I don't want to pursue this forever, but I do raise the question that if this program is so good and is so effective, and we are helping to generate companies that are good for the Nation, that is clearly what you are trying to do. But you wouldn't ordinarily do this if you weren't forced to do it. That doesn't quite ring true. If it is that good, why would you be limiting yourselves—of course, you are limited by our total appropriation, granted—if this is so good, why wouldn't you be moving toward a higher percentage of small business out of your total and not limiting it to 1.25 percent?

Mr. BEDELL. If the gentleman would either yield or wait until my time, I think I can shed some light on that problem.

Mr. OLIN. I would be glad to yield.

Mr. BEDELL. Do we take the time now, Mr. Chairman?

Mr. MAVROULES. Mr. Olin, are you through at this point?

Mr. OLIN. I am pretty close to being through. I would like a response to that question.

Mr. MAVROULES. We can always come back.

Mr. BEDELL. Let me tell you my perception and you correct me if I am wrong.

The decisions as to where your research money goes are made by a board—from a group of boards, are they not?

Mr. GREEN. We have a National Science Board of 24 members who advise us on how we set our priorities.

Mr. BEDELL. Of those 24, how many of those come from academia?

Mr. GREEN. Probably about 19 or 20.

Mr. BEDELL. The problem, Mr. Olin, I think is, that this tends to be run by academia. It is natural that if they are from academia, that they are going to say that the money should go to academia.

In my opinion, at least, there is a tremendous bias, by nature, in the National Science Foundation Board that the money they spend is going to go to colleges for college research rather than to small business for research of this type.

I guess the concern I have is the difference between Japan and the United States. One big difference between Japan and the United States is that we do a lot of basic research and then Japan takes that research and moves it into commercialization and benefits from it.

This program here—this SBIR Program—is more in the direction of Japanese research, in that we really move it right into commercialization and benefit from it. The reason we need this SBIR Program, I believe, that there is a tremendous prejudice against this type of research and in favor of basic academic research unless we have some legislation.

Mr. OLIN. I might just comment that it is very odd that it is that way. Maybe we ought to direct some legislation in that direction. Something just doesn't seem quite right.

Do you have any other comment on that, Mr. Green, and then I will yield back my time.

Mr. GREEN. No, sir; we do have, as Mr. Bedell said, that we do have a board that oversees the activities and we are responsible for supporting the general health of science and engineering in the United States; and there are many, many competing demands on our funds. We also get a lot of advice from the Office of Management and Budget and the Office of Science and Technology Policy. So I think that we have to factor those in in our final decisions.

Mr. OLIN. Fine. Thank you, Mr. Chairman.

Mr. MAVROULES. Thank you, Mr. Olin.

Could you possibly, Mr. Green, keep us abreast of the happenings overseas on this program?

Mr. GREEN. Yes, sir.

Mr. MAVROULES. We would appreciate that.

Mr. GREEN. We will do so.

Mr. MAVROULES. Mr. Bedell.

Mr. BEDELL. I have already taken my time.

Mr. MAVROULES. All right. Mr. McKinney.

OPENING STATEMENT OF HON. STEWART B. McKINNEY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CONNECTICUT

Mr. McKINNEY. Gentlemen, I apologize for being late. I thought it was rather humorous that I am coming to this high technology meeting and I was at my high technology cleaners when the computer went "aaahh". [Laughter.]

And nobody knows how to take a piece of paper out and say, McKinney, six suits, or something.

I just think it is very important that you realize in this day and age of Gramm-Rudman, and penurious Scrooges upon the Hill, but we have all of the positives so that we can keep the sharks at bay. A little shark repellent will be very handy for the chairman and for the rest of us who happened to your program—and I am not going to take your time—has been very successful in Connecticut.

I talked to Senator Weicker—he is as enthusiastic as I am. Mr. Bedell covered the whole thing by simply saying, I am so tired of us finding that the third amoeba to the right and the genetic scale produces good plastic and then the Japanese produced the plastic. I like a little application which this program has somewhat forced.

I would suggest to the gentlemen, if we don't think we have a problem, I just—on January 1, I sent my last check for my youngest child to Yale University. I am an avid reader of my old alma mater's budget, and I feel much better about it when I see how much we put in in basic academic grants from Uncle Sam—I feel like I am just a little part of the bankruptcy program.

But there is not enough practical application of what we learn, and I admire this program for that. It is very important. We are in a very competitive world and it seems to me that you gentlemen are either forced, kicked, or dragged, but rather successful into an area of—really the only area that is going to keep America competitive.

It is fascinating in a State like Connecticut to see that everything is gone: Bridgeport Brass, Singer, GE, Hair Dryer. I have been a very successful Congressman—I close them up faster than most people look at them.

But we have 3.4 unemployment—3.4 percent. The reason we have such a low unemployment is high technology, small business. That simple. And Mr. Mavroules' area of the world—I can remember when you could have driven three M-1 tanks side-by-side down Route 128 and not worry about a thing, including the traffic lights. Now, you can't roll anything, including a car, down Route 128.

Thank you very much for your testimony.

Mr. MAVROULES. Thank you very much.

PREPARED STATEMENT OF HON. STEWART B. MCKINNEY, A REPRESENTATIVE IN
CONGRESS FROM THE STATE OF CONNECTICUT

Mr. Chairman: Good morning and thank you for holding these hearings on the Small Business Innovative Research Program, which will expire in 1988 if we allow it to. I support your bill, H.R. 4260, which strikes the 1988 sunset provisions and makes this program permanent.

In a nutshell, the SBIR Program requires an agency receiving \$100 million or more in research and development to allocate one and a quarter percent of that to small business. Its three phases include: Initial funding of a project or innovation, continued funded for worthwhile projects and promotion of private sector investment in bringing that innovation into the marketplace.

According to the Small Business Administration, since the creation of the SBIR Program, over 33,000 names and addresses have been added to this program's mailing list. During the last 3 years, over 250 requests per week have been received in response to the program. The General Accounting Office confirmed the success of this program in its October 1985 report, stating that after 26 solicitations were issued, over 17,000 proposed projects were submitted and approximately 2,100 SBIR awards totaling \$156 million were made by the end of fiscal year 1984.

It is no wonder, then, that many States, including Connecticut, have recommended to the White House Conference on Small Business that SBIR be made a permanent program. I am looking forward to listening to the agencies involved with the program comment on how it is working and I thank you all again for coming to this hearing.

Mr. MAVROULES. Mr. Green, thank you very much and, gentlemen, thank you. I just want to remind all witnesses this morning that the record will remain open; there may be other questions that we might ask you.

Thank you very much for being with us.

Mr. GREEN. Thank you, sir.

Mr. MAVROULES. Our next witness is Dr. Clare I. Harris, Associate Administrator for Cooperative State Research Service, U.S. Department of Agriculture.

Dr. Harris, welcome.

Mr. HARRIS. I would like my colleague to join me.

Mr. MAVROULES. Of course. We would like to know their names also.

TESTIMONY OF CLARE I. HARRIS, ASSOCIATE ADMINISTRATOR,
COOPERATIVE STATE RESEARCH SERVICE, U.S. DEPARTMENT
OF AGRICULTURE, ACCOMPANIED BY OLGA OWENS, PROGRAM
MANAGER, SBIR PROGRAM

Dr. HARRIS. Thank you, Mr. Chairman.

My name is Dr. Clare I. Harris, and I am Associate Administrator of the Cooperative State Research Service in the U.S. Department of Agriculture.

My colleague is Dr. Olga Owens, who is the program manager for our SBIR Program.

I am pleased to have this opportunity to come before your committee to discuss the Small Business Innovation Research Program. The Department of Agriculture took part in the discussions following the passage of the Small Business Innovation Development Act of 1982, Public Law 97-219 to establish guidelines for the SBIR Program. Once there was agreement on how this program should be carried out throughout the Federal Government, we developed our program in the USDA consistent with those guidelines.

The U.S. Department of Agriculture invites science-based small business firms to submit research proposals in any of a number of topic areas that were defined by the Department. Our objectives are to stimulate technological innovation in the private sector and strengthen the role of small business in meeting Federal research and development needs.

We are also concerned with increasing private sector commercialization of innovations derived from USDA supported research and development efforts. Our program is designed to include three separate phases, as you have already heard from the NSF testimony.

Phase 1 is to determine the scientific or technical feasibility of ideas submitted by proposals on research topics. The Phase 1 proposals concentrate on research which will significantly contribute to proving the scientific or technical feasibility of the approach or concept and they are a prerequisite to further USDA support in the program.

The phase 2 awards provide follow-on funding to firms with approaches that appear sufficiently promising as a result of the phase 1 studies. The phase 2 projects are the principal research or research and development efforts.

Phase 3 projects to be conducted by the small business firm will be non-Federally funded through the exercising of a follow-on funding commitment. The purpose of phase 3 is to stimulate technological innovation and a national return on investment from research through the pursuit of commercial objectives resulting from the USDA supported work carried out in phases 1 and 2.

The functions of the SBIR Program have been centralized in the Department of Agriculture in order to most effectively and efficiently serve the SBIR community. A committee, within the Department, composed of members of each contributing agency established six research topic areas. They are as follows:

First, forestry and related resources projects to develop environmentally sound techniques to increase productivity of forest land to increase the utilization of materials and resources from forest lands.

Second, plant production and protection projects to find ways to increase crop productivity so that effective and efficient food production and agricultural systems can be developed and strengthened.

Third, animal production and protection projects to find ways to enable producers to increase production and to assure a reliable and safe supply of animal protein while conserving resources and reducing production costs.

Fourth, air, water, and soils projects to develop technology for using and conserving soils, water, and air resources while sustaining optimum agricultural productivity.

Fifth, food science and nutrition projects in the area of food quality and safety and in those areas that address the reduction of post-harvest loss. In addition, research proposals were solicited that dealt with the assessment of the adequacy of nutrient intake.

Last, rural and community development projects to find ways to develop business opportunities in rural areas and to look for innovative ways to manage small rural businesses.

A single solicitation has been issued each year for proposals in all of these program areas. In 1985 we received 314 proposals from which 34 were selected for funding. The fiscal year 1985 awards totaled \$3,150,946. Our first phase 1 grants were made in August 1983. Phase 2 awards resulting from successful progress were first made in August 1984. Phase 2 grants are for a 2-year period and the first of these will be completed in the summer of this year. Some successes in the program have already been achieved.

The SBIR Program has been successful in encouraging many small businesses to apply. There continues to be a high degree of interest in the program as evidenced by the large number of requests for our solicitation and the number and variety of proposals received. Many of the proposals contain highly sophisticated technological concepts. There seems to be little doubt that well trained scientists are finding employment in their own and other small business firms.

Mr. Chairman, this concludes my statement. We would be glad to respond to any questions.

Mr. MAVROULES. Thank you very much, Dr. Harris.

Would you describe some of the research topics in which your agency has requested proposals and what responses you are getting to the SBIR Program?

Dr. HARRIS. The response has been fairly evenly distributed across those six areas that are outlined.

Mr. MAVROULES. The ones that you mentioned?

Dr. HARRIS. Yes.

Mr. MAVROULES. OK.

Let me get into one of the areas here.

An early criticism of this program was that agriculture-based research was more in the province of our agriculture land-grant colleges and universities, and that small business was not especially qualified in this area.

Has this fear been realized or have you found good research capabilities in small business?

Dr. HARRIS. With regard to the capability interest of the small businesses, we have had a good response.

Mr. MAVROULES. In what areas are you finding good results?

Dr. HARRIS. As we point out, our program was only started in 1983, so the phase 2 program is still under way. We don't have any completions. Would you like an example of—

Mr. MAVROULES. Yes; of course.

Dr. HARRIS. Dr. Owens can give you—I think you mentioned you had one that was actually right at completion you might like to comment on.

Dr. OWENS. Yes; we have one that is actually completing its phase 2 and is about to go into phase 3.

Phase 3 means that they obtain outside funding from the private sector. This particular project has been very successful. It is a firm in Princeton, NJ, which has developed a method for detecting pregnancy in livestock. It is a sophisticated method. However, it has been simplified to the extent that a farmer in the barn can take a sample of milk or blood from an animal and determine whether the animal is in fact pregnant, following breeding.

This is a big help, naturally, for livestock breeders. This is now in kit form. They have successfully found a firm that will market it and they are about to sign a contract with the marketing firm.

Mr. MAVROULES. You are saying, if I hear you correctly, that the small business actually came up with that unique idea?

Dr. OWENS. Right.

Mr. MAVROULES. What would happen in the event that the SBIR Program were to be eliminated? Can you fund some of these programs from your department?

Dr. HARRIS. The funding authorities for research in the Department of Agriculture are in most cases somewhat restricted. Of course, the biggest part of the budget is in-house and we aren't really talking about that—but of the extramural funds, in going back to your comment about the land-grant university, State agricultural experiment stations, the authorizations for support to those institutions is authorized in such a way that private firms are not eligible to participate in those programs.

So we have rather limited authorities for which private firms are eligible to participate. So the elimination of the program would seriously limit our ability to continue this program.

Mr. MAVROULES. I take it, then, you favor the program?

Dr. HARRIS. We have had good success with the program. The rub comes with the competition for funds, and we are all aware of that.

Mr. MAVROULES. Very good. Thank you.

Mr. Olin.

Mr. OLIN. Thank you, Mr. Chairman.

Let me ask you, Dr. Harris—I understand what this program means to the Department of Agriculture because it is obvious; of course, most of the agriculture research is done in the land-grant colleges, I suppose—do you give out research contracts to, let's say, prior to the advent of this program, did you give out research projects to private industry.

Dr. HARRIS. A very limited number.

Mr. OLIN. Almost none.

Are you currently giving any projects other than these SBID's?

Dr. HARRIS. The U.S. Forest Service has had some projects with the private sector.

Mr. OLIN. But this is substantially the total activity in USDA with the private sector. It sounds like it is.

Dr. HARRIS. I am sorry, I didn't hear you.

Mr. OLIN. Is this substantially all of your activity with the private sector?

Dr. HARRIS. Essentially all of it.

Mr. OLIN. OK. Of course, you started it—how did you happen to start doing this?

Dr. HARRIS. As a result of the legislation.

Mr. OLIN. A lot of the departments didn't do it. You were prevailed upon to get this going.

From what you see of it so far—of course you are only a couple of years into it—do you visualize that this is something that you as a department would find to be productive enough to continue on your own some day?

Dr. HARRIS. As I pointed out, we do have some limitations under our existing funding authorities for research to actually enter into contracts with small businesses. We do have a Competitive Grants Program that is primarily a basic research program that is open to all individuals that could fund small businesses but because of its direction toward basic research, doesn't tend to be appropriate, really, for small businesses.

Mr. OLIN. I am not sure how you answered the question.

Dr. HARRIS. Essentially we have very limited authority to carry out such a program without the special authorizations.

Mr. OLIN. So from what you see now, you wouldn't continue this on your own, probably?

Dr. HARRIS. That is correct.

Mr. OLIN. How do you measure the success of it?

Dr. HARRIS. In terms of the interest, the proposals received, and our preliminary review of the work being done, we would say it is a productive program.

Mr. OLIN. Any time you want to give away money that is easy to get interest in that. I am not sure—what have you got on the output end of it as a measurement?

Dr. HARRIS. We mentioned one success that has gone all the way through and we are fairly early, but Dr. Owens could comment further on that if you would like.

Dr. OWENS. We have quite a few businesses which have completed their phase 1 work and are going into phase 2.

Mr. OLIN. You are really too early in the program to have the type of conclusions I am looking for.

Dr. HARRIS. In terms of actual applications we have very limited experience.

Mr. OLIN. I was just promoting the idea that if this program is really as good as you people seem to feel it is, it ought to, at some time, be self-generating, really. Because in agriculture, for example, you have listed six areas that are very important. One of the major things agriculture needs is to be more cost effective—and there is nothing better than a small business trying to work on that subject. If you began to develop contracts and ideas that were going to have payoff, you could get support for that—then from OMB, I will bet.

Does that concept have any attractiveness to you as a Department of Agriculture of trying to get projects that would have enough payoff so that you could get the funding to keep them going?

Dr. HARRIS. We are certainly interested in projects that are going to make sense in terms of being applied in industry. That is one of our goals, certainly.

As I indicated, though, the main constraint that we have is the authorizations that we operate our research programs under do have some limitations.

Dr. OLIN. I am well aware of that. I think I cut you off on that last answer. Let me just get back to that and then I will stop.

Dr. OWENS. Sir, I just want to tell you about one particularly interesting project. This is a man who owns greenhouses and is a grower of plants for vegetable and horticultural varieties. He has taken advantage of a known fact in plant physiology in which if you increase the carbon dioxide concentration in a greenhouse, you can increase the growth, because most plants are limited by the carbon dioxide content.

So he has worked out an effective and economical way to have a greenhouse with an increased carbon dioxide concentration. In order to do this he had to develop a carbon dioxide sensor and connect the sensor to a computerized system for controlling the carbon dioxide intake into the greenhouse. He has greatly increased his productivity of his own bedding plants.

In addition to that, he now has the CO₂ sensor and the computerized system to go with it—is now in the process of being marketed for other growers. So I think this is quite a successful project. He started with an SBIR.

Mr. OLIN. I would encourage you to get projects that are good enough so that you could get OMB to put up the money, and you wouldn't have to put it through this program. And then the thing would tend to be self-perpetuating.

Mr. Chairman, thank you very much.

Mr. MAVROULES. Thank you very much, Mr. Olin.

Before I defer to my dear friend from New York, Mr. DioGuardi, I have one comment. Of your six proposals here that you are working on—I am very impressed, by the way—number six stands out in my mind, rural and community development projects to define ways to develop business opportunities in rural areas and to look for innovative ways to manage small rural business.

Is there any way that you can monitor for the future the public/private ratio of funding? If you can monitor that and keep us abreast of that, we would be most appreciative.

Dr. HARRIS. We are early enough now that we don't really have any data but we certainly can get that.

Mr. MAVROULES. I realize that. As you well know, my position on the program is very strong but I want to back it up with more facts.

Joe, do you have any questions of these people?

Mr. DIOGUARDI. Yes.

Mr. MAVROULES. All right, Mr. DioGuardi.

Mr. DIOGUARDI. Good morning, thank you for your testimony.

I want to understand the economic cycle here. You are making grants to certain small businesses who apply to your agency. If in fact a patentable idea comes out of this, who owns the patent?

Dr. HARRIS. The patents are with the small business but the U.S. Government retains a paid up license for that patent. But they are there for the business to develop.

Mr. DIOGUARDI. So what is happening here is that proprietary rights can be developed by the people who get the grant. Are they required to match in any way the moneys that are given to them in the grant process? In other words, are they considered to be a partner with the Government in this?

Dr. HARRIS. There is special consideration in phase 2 given to those that can demonstrate that they do have other funding coming along to insure development, but there is no matching requirement as such.

Mr. DIOGUARDI. Do you think that from a business point of view that this is a fair arrangement for the Government that we are putting up all the money, that the rights to the patent then belong to the small business?

Dr. HARRIS. The small business is taking a risk and entering into an unknown area to develop a project, so they are bringing something to the project, certainly, there is some risk involved for them.

Mr. DIOGUARDI. You said diverting other resources, not necessarily money, but people or time. But you are saying the Government gets a paid up license so that if something is developed the Government then has the ability to use the idea—

Dr. HARRIS. Certainly.

Mr. DIOGUARDI [continuing]. But on a nonexclusive basis. The individual can then enter into arrangements with other users. It might be interesting to track the results of these grants to see which ones have resulted in economic rights for the small business. And therein may lie the answer to the questions on the other side as to whether or not there is a way to direct the programs so that it becomes increasingly more economic and self-sufficient so that the Government can continue the program from a seed money point of view. I think that is really where we are looking today where the Government shouldn't be taken out of things but should stay in kind of as a catalyst to make more activity happening—the key word being leverage. I think too many times we have tried to look to the Government to be the deep pocket to pay everything. That just doesn't work, because when the Government gets too involved it becomes too inefficient—too much of a bureaucracy.

I kind of like the idea of small businesses being able to continue the research and development efforts that we both then share in. The key is, how can we demonstrate politically that this is something that can be viable and self-sufficient so that we can continue the program. I think that is where we should start putting some of our efforts. Because maybe the public perception is that this is just another academic research program that educates the world and do we need that at a time when there are people homeless in the streets. I mean, that is the political equation we have to deal with constantly. But if we can show that in fact there are proprietary ideas being developed, and in fact the Government is a beneficiary, even though it doesn't show up in our budget because we have such lousy accounting systems around here—I am a CPA, as he knows, and I can't understand what the books say and I have been trained all my life to read numbers. But there is no way that we reflect

those proprietary rights in any of the numbers that we see so the public doesn't see it.

But somehow you may be able to package in a better way what you are doing so that we can make the public more aware of the fact that this program is resulting—not in cash today, perhaps, and that seems to be the only thing we think about when we look at the budgetary process, what is going to result in cash this year—but that there are rights the Government is developing through the program that are as good as money, because it will save us money in the future.

So maybe that is the way to package this. Mr. Chairman, I am just giving you a creative idea. I spent 22 years in the private sector as a certified public accountant and I would like to get under the numbers and this is maybe one way that you can approach this to make a better case to Congress and the public that this program is working even though you don't see the cash return this year.

Thank you.

Mr. MAVROULES. My colleague makes an excellent point. I think, Joe, prior to your arrival, Mr. Green of the National Science Foundation, testified. He indicated that on the ratio basis there is \$8 of private money invested for every \$1 that we give under the SBIR Program. They will continue to monitor this and continue to update us. I think that is the kind of information you are looking for to get the total picture of what is available out there.

Thank you very much. I appreciate your presence this morning. You have been very helpful.

Mr. Harry Johnson, Director for Small Business Innovation Research, Office of Commercial Programs, National Aeronautics and Space Administration. Welcome, Mr. Johnson, you may proceed at any time, my friend.

TESTIMONY OF HARRY W. JOHNSON, DIRECTOR, SMALL BUSINESS INNOVATION RESEARCH, OFFICE OF COMMERCIAL PROGRAMS, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ACCOMPANIED BY JOHN DEL GOBBO, PROGRAM MANAGER

Mr. JOHNSON. Thank you, Mr. Chairman.

I would like to introduce also Mr. John Del Gobbo, who is the program manager in my office.

Mr. MAVROULES. He does all the work, right?

Mr. JOHNSON. That is what that usually means, yes. Mr. Del Gobbo has the distinction of having been with the program since its inception, so he is the corporate memory as well.

Mr. MAVROULES. I am delighted to have you both.

Mr. JOHNSON. Not only that, he also was with the National Science Foundation before coming to NASA, so he has a greater background than most in this overall field.

Mr. MAVROULES. Very good.

Mr. JOHNSON. In a sense, our testimony will differ from the others because I do have a couple of visual displays that I think you might be interested in seeing.

Mr. Chairman, thank you very much for the opportunity to testify today. My name is Harry Johnson, and I am the Director of our SBIR office in NASA Headquarters.

I don't need to go into all of the detail that is perhaps contained in the written testimony that we have already submitted, but I will use it as the basis for comments and perhaps some additions and deletions both.

I had not intended, and I do not intend at this moment, except as you may wish me to, to go into great detail on how we operate the program, because what I intended to display is primarily the statistics and how it has been working, and some of our views on the program. But, of course, we will be glad to talk about the processes as well.

Mr. MAVROULES. As long as you can simplify it for us, since we are not technicians.

Mr. JOHNSON. As you are well aware, of course, we are now beginning the fourth year of our program. Each agency has a different start date for their cycle. Ours starts in the spring with the issuance of our program solicitation which went on the street a week ago. This document, which Mr. Del Gobbo has in front of him, contains all the instructions that are needed for anyone who wishes to bid for a phase 1 contract in our 1986 program.

The solicitation period closes at the end of June and we spend the summer evaluating the proposals and then making our decisions on what we can award for phase 1 contracts later in the fall. We expect that we will be awarding approximately 120 additional phase 1 contracts this year.

You might be interested at this point in looking at some of the statistics of our program to date [figure 1].

The chart that we will show here perhaps will tell you more than you wanted to know about statistics but I won't bore you with every detail figure.

Let me guide you a little bit through this. The horizontal lines indicate the 3 program years that we have in being today—1983, 1984, and 1985 program years. If you follow them across to the right you will see that we have divided this up into a discussion of phase 1 and subsequent follow-on phase 2 activities.

We received 977 proposals the first year; in contrast, the third year, last year, we received 1,164 proposals. The funding in the program, of course, did increase, based on the statute requirements. And as a result of this increase, we were able to increase the number of awards that we made from 102 in the first year to 150 in the third year.

Now, phase 2 programs lag about a year behind the selection for phase 1 for the obvious reason of the performance period for phase 1 and then the proposal evaluation in phase 2. So we only have 2 program years to describe at this point. In one of these, the program for 1983, we selected 58 of our 92 proposals for award. This last year we selected 71 proposals for award. [Table I.]

The dollars that are shown you can read for yourself. Over on the far right you will see that we expended \$28.7 million on the phase 1 and 2 programs combined from the 1983 solicitation. For the 1984 program year, we spent \$39 million. We expect to spend

something in the order of \$39 million on the current program, completing the program year 1985.

It may also interest you to see the amount of money that we have had available for the program based on the statutory requirement which has now reached a plateau of 1.25 percent of our R&D budget. Those numbers at the top represent the basis for the calculation of the SBIR budget, the SBIR budget fraction in the second line, and finally, the number of dollars in millions that we have applied each fiscal year. [Table II.]

Now, it is important to realize that we don't spend this money in the same fiscal year that it is appropriated and allocated to the program because of the inherent phasing aspects of the program. Phase 2 occurs a year later so you can see the obvious problem of trying to relate those moneys to program dollars directly.

I think it should be of interest to you to also realize that we perceive an increasing, not a decreasing, interest in the program, based not only on the number of proposals that we have received but also on the number of requests for program solicitations that we get. We have a very large mailing list. It contains more than 14,000 names at the moment, and it increases today at the rate of about 100 per day.

We expect to distribute 17,500 copies of this year's annual solicitation. Some of these will be distributed, of course, after the close of the solicitation period for this year, which is fine, because these represent information that people coming late into the program would need for preparing themselves for the future.

I might also mention something that came to my attention within the last few weeks. I had a conversation with a gentleman who works for a Canadian high-technology firm. Canada is now developing interest in a SBIR Program, so I am told. He requested of me some information on how we run the program and how it is set up through the statutes.

So in addition to the expression of interest that the Dutch have made, which you have already explored with the gentleman from the National Science Foundation—what you might be interested to know is that still another country is becoming interested in this process.

I think that it would be desirable now to talk a little bit about our assessment as we see it today. The program, of course, is really in its infancy in some ways. We have only 3 years of program in being, and only 2 years' worth of phase 2 portions of the program which have already been funded. So, considering that we really have only seen the completion of one or two phase 2 contracts in the program to date, it is, of course, a little premature to try to assess exactly how well all of the contractors have done in meeting any of NASA objectives or their own personal objectives in developing commercial product opportunities.

NASA differs from some of the other agencies—but not all—in one respect; many of the activities that we fund under our programs are aimed at the improvement of, and are part of, the NASA overall R&D program. They are not an add-on in the sense that we do this simply to stimulate interest in the small business community, but rather, to acquire important things for the Agency itself.

Now, that is the primary consideration, of course, in the eyes of many who evaluate our proposals within NASA. And that is a requirement and not just a desire; how well does the proposal seem to meet a defined NASA future requirement. It may be that many proposed ideas don't always have the same potential for commercial applications later. You understand the distinction that I am making, I trust.

Nevertheless, because of the infancy of the program, it is difficult for us to assess really how effective and how important all of these things are to the NASA Program, or to the economy, or to the success of small businesses. We believe that these objectives are being successfully met. We have evidence to suggest this. But we have not, as of this moment, begun a specific program evaluation, which we intend to begin later this year, to try to come up with more substantive numerical, factual statements which could help in this kind of an assessment.

But there are some things that are very positive. For one thing, we have come to recognize that the SBIR Program has provided a new type of opportunity that was not really available to the Agency; namely, the use of small firms in its R&D program, which firms have rapid turnaround time, exceedingly high interest level, and responsiveness in doing the work. In many cases, they do things which are quite innovative that might not have been suggested by a larger firm, or by other small businesses, because of the lack of opportunity for addressing a large agency such as NASA.

So, we are very pleased that we have been able to introduce as many as 250 small businesses into the SBIR Program, through both phase 1 and phase 2.

To correct any possible misinterpretation, we do not have 250 businesses in phase 2, but 250 businesses which have already passed through the phase 1 period, many of which, of course, have phase 2 contracts.

The interest in the research staffs in our research centers who are responsible for all of the work in our NASA R&D program is quite high. There is considerable competition among our centers for obtaining the funds from our office for the SBIR Programs. It is not just because it is another means of providing R&D funds, but because they really see a tremendous new opportunity for getting new ideas into their programs rather quickly without some of the ponderous requirements of procurement that otherwise exists when we go out on a more general procurement.

We have the belief, at this point, that this has been a cost effective program for us. In other words, the accomplishments in phase 1 and what we believe will be accomplishments in phase 2, will have been achieved, in many cases, for far less money than we might have had to spend on other types of contracting activities toward these same ends.

With regard to how well the program to date has achieved what we interpret to be the legislative objectives—those which were stated in the law and in the guidelines published by the Small Business Administration for all agencies involved in the program—we would again say that it is probably premature to give a firm final statement on any of these objectives. But there is evidence that we have—that we see from our own contacts—that the pro-

gram is successful, or will be successful in meeting these objectives. I will give you a couple of examples.

First of all, as I have already mentioned, we have introduced a large number of small businesses into the NASA program that would not otherwise have been there. We think furthermore, that this has a technical benefit—it is not simply a set-aside. Their efforts are integrated into the total NASA R&D program. They are not something off to the side or an adjunct.

The second objective of helping, or encouraging, and providing opportunities for small business to achieve commercialization of their efforts has yet to be proven. But we do know that there are some indications now that that is already happening. I cannot give you very many chapters and verses on this, but we have received—both Mr. Del Gobbo and I—a number of volunteered comments that this program has made it possible for certain firms to acquire business capital to pursue their ideas commercially. And it has also made it possible for them to identify customers that would not otherwise have been there without their phase 1 and now phase 2 programs with NASA—and sometimes with other agencies, too. Many firms, of course, deal with more than one agency.

Another objective which was to encourage the involvement of minority and disadvantaged businesses, we believe also is being achieved. Although this was never a criterion for selection in our process, it has happened that a significant percentage of our funds—and I believe that we found this to be 11.6 percent last year of our SBIR funds—went to minority and disadvantaged firms.

Mr. MAVROULES. You said 11.6 percent went to a particular group. Am I correct?

Mr. JOHNSON. Yes.

Mr. MAVROULES. Did you do that on your own, because that is not written into the law? Did you do that by design?

Mr. DEL GOBBO. No, sir: that was an outcome, not a design.

Mr. MAVROULES. Good.

Mr. JOHNSON. I think I may still not quite understand.

You mean, did we intend it to be this kind of a number?

Mr. MAVROULES. That is correct.

Mr. JOHNSON. No; we did not.

Mr. MAVROULES. This just came about?

Mr. JOHNSON. This came about.

As I said, we have not consciously used this factor as a criterion for selection. We were primarily concerned with the technical and scientific merit of the work.

I have another chart that is not in the written statement that you have available to you which you might be interested in looking at, and that is the distribution, the demographics of our program to date.

This chart shows the placement of phase 1 and phase 2 contracts in the NASA program throughout the United States. There are a number of interesting points. I don't intend to dwell on any of them, but clearly, it is not a uniform distribution. There are several States, including Massachusetts and California, which have a very large fraction of our awards.

Mr. MAVROULES. I am not complaining about that, my friend.

Mr. JOHNSON. As a matter of fact, there are a number from, I believe, a familiar city in Massachusetts, Peabody, specifically, that are involved and not just in our program.

Mr. MAVROULES. Joe, we will take care of New York, so just stay calm. [Laughter]

Mr. JOHNSON. We make a specific effort to be sure we make our program opportunities known to everyone; not just on the basis of the solicitations that we distribute on request, but also by participation in a variety of National- and State-sponsored small business meetings to describe not only the SBIR Program but all Federal opportunities for small business. Both Mr. Del Gobbo and I attend quite a number of these each year to describe our program and to explain how one would go about becoming involved in NASA's program. But despite these efforts, it does not happen.

I suppose it would be unreasonable to suspect that it would happen, that there could be a uniform success rate in every State. Obviously, those States which emphasize high technology for one reason or another, in which the business environment permits this, have a much greater natural opportunity—and this is reflected in the number of proposals we receive, of course. So I thought you might be interested in that chart.

At this point, I think that I will pause and indicate to you that if you have any questions I would be happy to answer those. That would end my formal statement.

Mr. MAVROULES. Thank you very much. Your formal statement, will be included in the record.

[Mr. Johnson's prepared statement, with attachments, follows:]

PREPARED STATEMENT OF HARRY W. JOHNSON, DIRECTOR,
SMALL BUSINESS INNOVATION RESEARCH,
OFFICE OF COMMERCIAL PROGRAMS, NATIONAL
AERONAUTICS AND SPACE ADMINISTRATION

Mr. Chairman and Distinguished Members of the Subcommittee:

NASA's Small Business Innovation Research (SBIR) Program has begun its fourth annual cycle. Each cycle begins with an annual SBIR Program Solicitation, published in the spring, inviting Phase I proposals in all topics and subtopics of interest to NASA. Phase I proposals selected for award in the 1983, 1984, and 1985 programs totalled 379, and 129 Phase II award selections were made as follow-on to the 1983 and 1984 Phase I contracts. We anticipate that at least 60 Phase II award selections will be made in November 1986 as follow-on to the 1985 program Phase I contracts.

The 1986 Program Solicitation period began the first of May and will close on June 30. The Solicitation includes 15 technical topics subdivided into 183 subtopics encompassing every area of aeronautics and space technology in which NASA is involved. We anticipate selecting, during October 1986, approximately 120 proposals for Phase I awards from the 1986 solicitation.

PROGRAM STATISTICS

NASA's SBIR program statistics for the first 3 years are listed in Tables I and II. Table I lists the numbers of Phase I and Phase II proposals received, awards made or currently being negotiated, funds applied to each year's Phase I and Phase II programs, and the average award values. Table II lists NASA's annual research and development (R&D) budgets and the portions allocated each fiscal year to the SBIR Program. The funds actually expended (obligated) in fiscal years 1984 and 1985 were \$4.980M and \$29.403M, respectively. Differences between those numbers and the SBIR budget allocations for fiscal years 1984 and 1985 shown in Table II result from the inherent phasing requirements of the program. R&D funds set aside for SBIR in any fiscal year may support portions of three annual programs.

Table I also shows the numbers of Phase II proposals and awards for which Phase III follow-on funding commitments were identified. Approximately 57 percent of all Phase II proposals and 58 percent of all Phase II awards indicated such commitments.

It is worth noting that active interest in NASA's SBIR Program continues to increase, as indicated by both the number of Phase I proposals received and the number of requests for the annual Program Solicitation. Our Solicitation distribution list is based largely on written requests, and exceeds 14,000 this year; this is about 30 percent larger than last year's list. In addition to our mailing list, many other copies of each annual Solicitation are distributed by our Field Centers, and others are provided to attendees at many SBIR outreach conferences sponsored throughout the year by Federal and State groups, in which NASA participates. We expect to distribute up to 17,500 Program Solicitation documents this year, compared to 14,000 distributed last year.

PROGRAM ASSESSMENT

Although we are entering the fourth program year, it must be noted that Phase II contracts, which represent the principal R&D activities, are only now getting well underway. The first group of Phase II contracts (1983 Program Year) was placed within the last 15 months, and a number of the second group, the 1984 Program Year Phase II contracts which were selected last November, are still being negotiated. Phase II contracts are typically of 2 years' duration and, at this time, only one or two Phase II contracts have been completed. Therefore, it is too early to evaluate the technical program comprehensively, to predict accurately the ultimate value of the R&D either to NASA or the small business firms involved in the program, or to assess the program's impact on the national economy. Nevertheless, some preliminary findings and views are available, and these are quite positive.

Since the enactment of the SBIR statute, NASA research personnel and their management have developed strong support and enthusiasm for the program. NASA has found that a great number of new and attractive approaches to problems and opportunities identified in the Program Solicitation have been offered by a large number of innovative small firms. Many of these ideas had not previously been volunteered to NASA by those firms, and possibly would never have been offered in the normal course of events. The SBIR opportunity and stimulus made it possible for them to reach NASA's attention and to be funded. Of course, a number of proposals received each year have been judged not to have great merit; nevertheless, we are greatly pleased with the high incidence of high-quality, thoughtfully-developed R&D proposals resulting from our Solicitations, and fully expect that the end results and products will be quite valuable to our programs.

One conclusion, based on 3 years of experience in the program, is that the SBIR Phase I - Phase II approach and program management philosophy have provided a very cost-effective means for exploring new ideas rather quickly. The rapid response capability of our SBIR firms, and their generally high motivation and skill levels, have proved to be genuine assets in our overall program. SBIR contract efforts are viewed as integral and important elements of

the overall NASA R&D program, albeit comprising a relatively small total increment. Among the SBIR projects are the development of new analytical methods, designs, software, and hardware for direct use by NASA in our total R&D and operational program activities.

ACHIEVEMENT OF SBIR OBJECTIVES

It is somewhat premature to assess how well all the objectives stated in the statute are being achieved in the NASA program. As the program proceeds, we will evaluate this topic but, at this moment, we can merely report indications. As noted previously, it seems clear that SBIR has been successful in the objective of drawing many small businesses into the NASA program; about 250 small businesses have been awarded SBIR contracts by NASA. There is also evidence that the SBIR objective of fostering commercialization of innovations already appears to be successful in a number of instances. Although we have not yet attempted to collect data on this objective, several of the firms in the program have indicated informally that they have acquired viable commercial capabilities and financial backing as a direct result of R&D they have pursued in our (and other agencies') SBIR programs.

Finally, there is also evidence that the objective of encouraging greater participation of minority and disadvantaged persons in NASA's program is being achieved. During fiscal year 1985, 11.6 percent of the SBIR funding obligations went to minority and disadvantaged small businesses.

IMPLEMENTATION PROBLEMS

While we have developed the SBIR management philosophy and procedures through an iterative process, we have experienced no unique problems in implementing the program. We are pleased with the smoothness of the program's conduct so far, and with its incorporation at our Field Centers as a desirable part of their programs.

This concludes my formal statement. I would be happy to answer any questions the Subcommittee may have.

NASA SBIR PROGRAM STATISTICS FOR FIRST THREE PROGRAM YEARS

TABLE I

PROGRAM SOLICITA- TION YEAR	PHASE I				PHASE II						TOTAL PROGRAM FUNDING \$M
	PRO- POSALS	AWARDS	TOTAL FUNDING \$M	AVERAGE FUNDING \$K	PRO- POSALS	AWARDS	TOTAL FUNDING \$M	AVERAGE FUNDING \$K	PHASE II FUNDING COMMITMENTS		
									TOTAL	AWARDS	
1983	977	102	4.93	48.3	92	58	23.77	410	54	37	28.70
1984	919	127	6.23	49.1	113	71	32.91(1)	463(1)	62	38	39.14(1)
1985	1164	150	7.43	49.5	NA	NA	32.0(2)	NA	NA	NA	39.43(2)
TOTALS TO DATE	3060	379	18.59	49.1	205	129	88.68(2)	439	116	75	107.27(2)

NOTES: (1) 1984 Program Year Phase II and Total Funding are estimates pending completion of Phase II contract negotiations.

(2) 1985 Program Year Phase II awards will not be made before late 1986. Phase II and total funding are estimates.

NASA SBIR FISCAL YEAR FUNDING

TABLE II

	FISCAL YEAR 1983	FISCAL YEAR 1984	FISCAL YEAR 1985	FISCAL YEAR 1986
NASA R&D BUDGET - \$M	2473	2205	2425	2609
% R&D BUDGET FOR SBIR	0.2	0.6	1.0	1.25
NASA SBIR BUDGET - \$M	4.94	13.23	24.25	32.61

Mr. MAVROULES. I am delighted with your testimony. Obviously, you know I am a great supporter of the program, and the more I listen to the testimony here this morning, the more I am convinced we are going in the right direction.

I am going to make one request, however. It has to do with what Mr. DioGuardi referred to before. It is imperative that we who make our decisions relative to reauthorization certainly have got to have background. The better the information we have, the better the argument we can put forward.

Can you at this point, or is it too early, give us the private/public ratio of spending on each grant that you are giving out? If you have any idea at all, we would appreciate that information within a few days.

Mr. JOHNSON. Let me tell you that I personally do not have that. Perhaps Mr. Del Gobbo has some indication of this, but I do not.

Mr. DEL GOBBO. As of this time, we have one of our phase 2 contracts completed. We will have one more completed at the end of this month. The great majority of our phase 2 contracts will be ending in the spring of next year.

Mr. MAVROULES. OK.

Mr. DEL GOBBO. I feel it is too early to make a survey of the—

Mr. MAVROULES. I realize that. If there is any way that you could get that information to us, it would be most helpful.

Mr. DEL GOBBO. We would be certainly delighted to canvass everybody and ask where they stand on that.

Mr. MAVROULES. Mr. DioGuardi.

Mr. DIOGUARDI. I appreciate your testimony.

Mr. MAVROULES. What steps will your agency take this year in anticipation of the sunset provisions now in the statute?

Mr. JOHNSON. Mr. Chairman, this is a very interesting question, and I suspect that most agencies have different answers to this.

Ours is that we recognize several things—or at least our general counsel has suggested several things to us. It probably is not legal for us to proceed with an SBIR-type program beyond the sunset date, even if we wish to do so, at least within the same constraints and guidance that governs the SBIR Program today.

This is as a result of a number of things, which includes the provisions of the CICA and also, in general, of the Federal acquisition regulations.

The agency, in recognizing this, has to be prepared to terminate its program in the event that there is not a continuation of the program beyond the sunset date, therefore. Because of the way we fund the program, which means that we are always funding our phase 2's at least a year after the selection of their phase 1 precursors, it is necessary for us to plan our budget so that we have enough money at the end to fund those contracts which have started a year before.

What I am driving at is that the inevitable consequence of this is a phasing down of the number of awards made 2 years before, which means this year, as a matter of fact. That is not an ominous statement at all, because one can look at it this way: We will have a certain total amount of money to spend on the SBIR Program through fiscal 1988 just as legislated. It will buy a certain number of phase 1 and phase 2 contracts, and that is all.

The exact phasing of when those take place, or when those contracts are let, is the issue. My point is that without the extension, the program requires us to begin anticipating that that money will have to be used to pay for work which was started as much as 2 years earlier and, therefore, this has its bow wave effect back into our present budget.

So, starting this year, we would reduce the number of phase 1 and phase 2 awards that we would otherwise have made, based on continuity in the program.

Mr. MAVROULES. If the reauthorization were to take place during the next couple of months, however, would that stop you from taking this kind of action?

Mr. JOHNSON. That would have a dramatic effect on our program.

Mr. MAVROULES. I think what I want to hear from you is that unless you get the SBIR Program going, these programs will go out the window in the future; am I correct?

Mr. JOHNSON. As I stated earlier, it is our general counsel's view that it would be illegal for us to proceed without this legislation.

Mr. MAVROULES. You have already stated you favor the SBIR Program.

Mr. JOHNSON. That I favor?

Mr. MAVROULES. Yes.

Mr. JOHNSON. That is my personal view, yes, sir. But you understand that I have to make you realize that that is more of a personal view than an agency position at this time.

Mr. MAVROULES. I understand.

Let me ask one final question.

In hearings before the Senate in 1983, it was brought out that the shuttle program had been effectively removed from NASA's R&D budget and transferred to your operational budget. This had the obvious effect of decreasing the amount of R&D money that would be available for the SBIR Program.

Can you tell me why this accounting change occurred, and was it, as many assumed, a result of the SBIR program?

Mr. JOHNSON. Mr. Chairman, because that preceded my personal participation in the program, I may be not quite as factual in this as others perhaps could be. But let me make an effort and see if I can answer the question.

Traditionally, the NASA budget had one fund source for funding all activities related to personnel, called R&PM, the funds which go to pay civil servants and associated expenses. Another fund source paid for the construction of facilities, and everything else was called R&D, regardless of whether in the abstract it really was R&D. And certainly the operations of the shuttle program were not considered by most people within NASA to be truly R&D. Therefore, the position was taken that it would not be appropriate to tax them as R&D since the intent was to make the SBIR Program a part of the truly defined R&D effort of the Agency.

That was the basis for the change in the fund source designation.

Now, if I have omitted anything or have given you a misconception—let me ask Mr. Del Gobbo if he has anything to add to that.

Mr. DEL GOBBO. No, sir; nothing to add.

Mr. MAVROULES. OK.

Gentlemen, thank you very much. I am most appreciative of your testimony. You have been very, very helpful here this morning.

The meeting is now closed until 9 o'clock on Tuesday morning. At that time we will have the DOD representatives.

[Whereupon, at 10:40 a.m., the subcommittee adjourned, to reconvene at 9 a.m., Tuesday, May 13, 1986.]



H.R. 4260—REAUTHORIZATION OF THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT

TUESDAY, MAY 13, 1986

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON GENERAL OVERSIGHT
AND THE ECONOMY,
COMMITTEE ON SMALL BUSINESS,
Washington, DC.

The subcommittee met, pursuant to notice, at 9 a.m., in room 2359-A, Rayburn House Office Building, Hon. Norman Sisisky (acting chairman of the subcommittee) presiding.

OPENING STATEMENT OF ACTING CHAIRMAN SISISKY

Mr. SISISKY. The meeting will come to order. I apologize for the chairman this morning. He was unavoidably detained. He will be here at about 10 a.m. Because we have a full day, I would hope that we could start almost close to being on time.

Today we are continuing our review of the Small Business Innovation Research Act and the implementation efforts of the participating agencies.

Testimony we received last week indicated that by all accounts the SBIR Program has been a success. I believe today's witnesses will also give us a good report on the excellent quality of their own SBIR Programs.

I am looking forward to the testimony we will receive this morning from the Department of Defense, and the Department of Energy, and the testimony from the National Institutes of Health and Department of Transportation, which we will hear this afternoon.

This program has so much to offer our Nation. And for that reason, as I have stated before, we on the committee want this program to continue. I hope this commitment is shared as well by the participating agencies.

Before proceeding, I would like to add that the Department of Education was unable to testify today because of a scheduling conflict. They have, however, submitted a written statement by William J. Bennett, Secretary of Education, which I will insert into the record, without objection.

Do you have any statement, Mr. Conte?

Mr. CONTE. In the interest of time, I will submit it for the record.

OPENING STATEMENT OF HON. SILVIO O. CONTE, A REPRESENTATIVE IN
CONGRESS FROM THE STATE OF MASSACHUSETTS

Mr. Chairman, I want to thank you for holding this series of hearings on the Small Business Innovation Research or SBIR Program.

As a strong supporter of SBIR, and as a cosponsor of the chairman's bill to repeal the sunset date of the statute, I look forward to the testimony today by the various Government agencies that are represented.

The subcommittee is especially interested in learning how the program has operated so far within these agencies, whether or not there is sufficient support for extending it beyond the 1988 sunset, and if it has lived up to its expectations.

Last summer, Mr. Chairman, you held a series of hearings on the program. I was extremely impressed with the number of small businessmen across the country you assembled to testify to the tremendous success of SBIR. The breadth of the research and knowledge that has been contributed to the Government by these individuals impressed us all, I think, and the hearings were a testament to the success of the program.

Today, we will hear from the administration, as we will in the future hearings today and later this week. I look forward to hearing how each agency, subject to SBIR, administers the program, and how successful it has been.

[Mr. Bennett's prepared statement follows:]

PREPARED STATEMENT OF WILLIAM J. BENNETT,
SECRETARY OF EDUCATION, U.S. DEPARTMENT
OF EDUCATION

Mr. Chairman and Members of the Committee:

It is with some satisfaction that I report to you on the first three years of the Small Business Innovation and Research (SBIR) program in the Department of Education. The purpose of the program is to provide funding to small businesses to develop innovative ways to improve American education. This year, about \$1.47 million will be awarded by the Department of Education.

The Small Business Innovation Development Act, P.L. 97-219, was signed by President Reagan in August 1982 and was further supported by a memorandum from the President to agency heads in September 1982.

The Act is based on the premise that small firms can conduct research and development activities efficiently and are especially effective in marketing new products. It requires every Federal agency with an extramural research and development budget exceeding \$100 million to set aside a percentage of that budget--1.25% for each fiscal year 1986 through 1988--for a special competition limited to small, profit-making firms, to conduct research and development of interest to the particular agency.

The statute sets forth three phases for the program: (1) determining the scientific and technical merit and feasibility of ideas submitted pursuant to SBIR program solicitations, (2) researching and developing the proposed ideas to meet the particular program needs, and (3) developing commercial applications of the research and development which may also involve non-SBIR Federal funding.

The Department of Education is one of twelve Federal agencies participating in the SBIR program. Four organizational components in the Department have been the prime contributors to the program: The Office of Special Education and Rehabilitation Services, the Office of Educational Research and Improvement, the Office of Bilingual Education and Minority Language Affairs, and the Office of Postsecondary Education. Each Office contributes by setting aside resources, identifying topics for the Phase I solicitation, reviewing and rating proposals, selecting awardees and monitoring the projects.

The Department has successfully operated the SBIR program since it first began in fiscal year 1983. In fact, it has exceeded the legislated set-asides which were 0.2 percent, 0.6 percent, and 1.0 percent respectively for fiscal years 1983, 1984, and 1985. During fiscal year 1983, eight Phase I awards were made from a single solicitation which generated eighty-four proposals. The average award in that first year for Phase I was nearly \$39,000 for a six-month period. The Department's extramural research and development budget was \$116 million in fiscal year 1983, of which \$232,000 was set aside for small business firms. Some \$311,000 was actually obligated during that year.

Fiscal year 1984 was the first year in which both Phase I and Phase II awards were made. Thirteen small business firms received awards from a single Phase I solicitation which generated 234 proposals. Three Phase II recipients were chosen from seven applicants which had conducted Phase I projects in 1983. In total, the Department's fiscal

year 1984 extramural research and development budget was \$111.8 million, of which \$671,000 was set aside for small business firms under the SBIR program. For fiscal year 1984, over \$964,000 was awarded for Phase I and Phase II, including \$270,000 for 1985 costs of Phase II projects, which span two fiscal years. Therefore, fiscal year 1984 obligations totaled \$694,000, or \$23,000 more than the set aside.

In many ways fiscal year 1985 mirrored fiscal year 1984; that is, thirteen small business firms received awards from a single Phase I solicitation which generated 142 proposals. Additionally, the one Phase II competition during fiscal year 1985 resulted in five awards from eleven proposals received. The Department's extramural research and development budget for fiscal year 1985 was \$111.4 million, of which one percent, or \$1,114,000, was set aside for small business firms. During fiscal year 1985, a total of nearly \$1,376,000 was awarded for Phase I and Phase II competitions and \$1,161,000 was obligated, once again reflective of Phase II awards spanning two fiscal years.

The Department of Education extramural research and development budget for fiscal year 1986 is \$117.6 million of which 1.25 percent or \$1,470,000 has been designated under the provisions of the SBIR programs. Several new topics were introduced to small business firms by the Department in its fiscal year 1986 Phase I request for proposals. These include:

- o innovative approaches in such areas as learning and instruction at the elementary school level,
- o use of technology in communicating research results,

- o application of technology to the teaching of uncommonly taught modern foreign languages,
- o instruction of adult learners, and
- o the assessment of educational outcomes.

The Phase I solicitations generated more than 1,800 requests from small business firms. Over 200 proposals were received by the Department through March 31, 1986--the closing date for that solicitation. Eligible proposals are currently being reviewed and rated by a minimum of three qualified Federal employees. It is estimated that thirteen to fifteen Phase I awards of about \$30,000 each will be made.

Three to five Phase II awards are expected from the thirteen eligible small business firms. Phase II awards will continue to total approximately \$200,000 each for the two-year period. Final awards from Phase I and Phase II competition are to be made during the summer months.

During the first three years of the SBIR program, a dozen topics identified by the Department of Education to small business firms generated a number of promising proposals which are now being supported.

For example, a small business firm in New Hampshire designed and is currently testing in a local high school, a science laboratory teaching and learning approach using microcomputers. The secondary school science program was developed by a team of professional scientists, engineers, computer programmers, and educators. It stresses science

concepts and laboratory skill development. Science students are expected to expand the number and variety of opportunities to participate in hands-on experiments. Additionally, these students will engage in laboratory experiences using current technology to aid them in future job opportunities.

A second SBIR award sought the application of new technology to aid state and local managers reduce administrative costs, and permit easier access to information for educating handicapped children. In response, a small business firm in Virginia developed a comprehensive administrative software package for computer use. The current price for the recently marketed product is \$495. The firm's earlier administrative software package sold for \$4,500. Additionally, the newer product has been tailored to meet individual user needs.

A third small business firm in California is developing a computer based english grammar and spelling monitor for use in schools. The expected product is a software package for use with word processing equipment. It is currently being prepared for and with junior high and bilingual students and teachers. Successful completion of the software package will permit teachers and students to spend more time on developing writing and thinking skills, leaving identification of grammar and spelling errors to computers.

The Department of Education SBIR program is still relatively new. The first three Phase II awards have just recently been completed. In fact, awardee final reports have not yet been submitted to the

Department. Awards under Phase III--commercial applications of products generated through Phase I and II--while promising, have yet to meet the market test. Therefore, the Department has not engaged in an overall evaluation of its SBIR program.

In summary, the Department of Education has complied with the provisions of the Small Business Innovation Development Act. It has exceeded the minimum financial set-asides specified for each year. We are encouraged by and support the Small Business Innovation Research program. We look forward to supporting promising ideas generated by small business firms to improve teaching and learning.

Mr. SISISKY. Our first witness today is Dr. Ryszard Gajewski, who is the SBIR program manager, for the Department of Energy.

Dr. Gajewski, welcome, sir, and you may proceed.

**TESTIMONY OF RYSZARD GAJEWSKI, SBIR PROGRAM MANAGER,
DEPARTMENT OF ENERGY**

Dr. GAJEWSKI. Thank you, Mr. Chairman. It is a pleasure and an honor to represent the Department of Energy in this hearing. I would like to submit the written statement for the record. And with your permission, Mr. Chairman, I would like to highlight some of the issues that are included in that statement in my oral testimony.

Mr. SISISKY. Without objection your statement will be placed in the record.

Dr. GAJEWSKI. When the Small Business Innovation Development Act was first enacted we at the Department of Energy looked at it as an opportunity to tap the talent, the resources, scientific and technical, that reside in the small business sector, and to channel them into the mainstream of the Department of Energy research and development activities.

Almost 4 years have passed now; we have reviewed some 4,000 proposals; we have made some 400 phase 1 awards; we have made about 100 phase 2 awards; we have gained experience. And while it may very well be too early to undertake a full evaluation of the SBIR Program, it seems an opportune time to share with the committee some of the experiences and some of the concerns that we have about the program.

Perhaps the most striking feature of the SBIR Program, as we see it in the Department of Energy, is its very high technical quality. In fact, the commitment to technical excellence was the very basis of our enthusiasm with which we approached the SBIR Program.

The technical managers throughout the Department report overwhelmingly that the quality, the technical content of the projects that are supported under the SBIR Program, is comparable to that

of the best projects that are supported by the Department of Energy outside of SBIR; that is, projects at universities, national laboratories, and so forth. Now, clearly the nature of the SBIR projects differs, as it should, from the nature of some, say, basic research projects that we support at universities. We are very mindful of the need to pursue phase 2 commercialization objectives. At the same time, however, judgments can be made as to the technical content of the projects and in those comparisons the SBIR projects fare quite well.

A vehicle which made it possible for us to accomplish such high quality was the principle that we adopted of merging funds that the DOE receives from various appropriations into a single SBIR fund. By doing so, we were able to entice the various technical programs that participate in SBIR into a healthy competition.

In order to get back, in the form of funded SBIR projects, what they contribute in the SBIR fund, they have to make sure that the topics that they submit for inclusion in our annual solicitation are of high quality; the proposals will never be of higher quality than the topics which we propose to the community. Also, they must be diligent in publicizing topics in the program solicitations in their respective communities, so as to attract good proposals.

The results of that competition so far seems to be very salutary to the quality of the program. Because the funds are merged, we are allowed to select the best proposals that we receive, independent of the technical area, from which the proposal comes. At the same time we must be concerned about the program balance, the overall balance of the SBIR Program, so that the program would reflect the departmental priorities. The way we go about it is that we allocate the number of topics going into each solicitation in rough proportion to the contribution that the respective program area makes to the SBIR fund. So, the more money we get from a particular program, the more topics that program is allowed to put into the solicitation. However, once the topic is in the solicitation, then the solicitation becomes, essentially, program blind, and from then on the technical quality is the foremost consideration in selecting the projects. That system has worked quite well.

I would like to share with you, Mr. Chairman, and the members of the committee, an experience that I think is important; namely, it appears that there is no technical activity within the range of the Department's interest to which the small business sector could not contribute.

We were asked at the beginning, how can you imagine that small business can make a contribution to a singularly esoteric field such as high energy particle physics?

Well, the managers of that program got to work and they thought of areas within the program to which small business could make significant contributions. In return for their diligence, they are getting very high quality projects.

At this point, I would like to give you an example of a project that we have supported, to give you a flavor of the kind of things that SBIR supports. This one would be typical in many ways.

In order to accelerate particles, say electrons, effectively—and DOE has major responsibilities and a major program in accelerator development—you need to utilize the electricity that is used to ac-

celerate those particles in a very efficient way. Now, a particular kind of accelerators, called radio frequency linear accelerators, involve injecting radio frequency waves into hollow structures, called cavities. Typically much of the power of that electricity is lost converting to heat in those structures. It is just like a metal foil that you put into a microwave oven, it will heat up.

So scientists thought of methods of how to avoid those losses, because whatever electricity converts to heat, you cannot use to accelerate particles. Scientists came up with the idea of using superconducting metals for those cavities—it turns out that superconductors don't really permit currents to flow in them, so there are no losses. They tried the idea but it turned out that the losses were still there. To everybody's surprise the superconducting cavity walls still displayed sizable losses.

Scientists looked at the problem more carefully, and it turned out that the losses were due to minute imperfections, microscopic imperfections, on the surface of the cavity wall. The cavity wall is made of the superconducting metal niobium, so now the problem was how to make sure that the sheets of niobium incorporated into the cavity would be virtually perfect, would be free of those surface imperfections.

Well, this was a problem that our managers thought could be looked at by imaginative scientists and engineers at small businesses, and a proper topic was introduced into one of our solicitations. One of the proposals came up with a very ingenious way of inspecting those sheets of niobium for minute imperfections. I don't want to bore you with the details, but briefly the way it works is a sheet of niobium is immersed in a fluid. In that fluid, acoustic waves are generated which reflect from the niobium surface and then from the pattern of the reflected waves. Using laser scanning you can deduce the presence or the absence of those imperfections.

So, you see here is a topic with an extremely high degree of technical sophistication and, at the same time a topic which a small business was able to tackle very efficiently. As I said, I could go on and on with such examples, but this should give you a flavor of the kind of sophistication contained in our projects.

I would like to just mention two problems—and one of those we have essentially solved. The first problem has to do with the cost of running the SBIR Program. The SBIR Program is labor intensive.

It is labor intensive to process the many hundreds of proposals that we get every year, and very important, to assure a timely and high quality technical review—and I may say that our selection process is only as good as the quality of the technical review. Now, all this presents a significant burden on the Department's resources. I might also mention that we engage in a number of outreach activities. For example, for the past 2 years we have, jointly with the National Science Foundation, supported SBIR-oriented major conferences. It would be very helpful if a favorable interpretation could be obtained under the provisions of Public Law 97-219, that would allow the use of some SBIR funds for support services activities, for program direction.

Now, to give you an idea of what kind of money we are talking about, I think that about 1 percent of the SBIR fund should be ap-

propriate at least in the case of the Department of Energy; that would be a great help.

The other problem, as I said, is one that we are on the verge of having solved, but I want to mention it too, because I think it is an important problem and should be identified. We are not seeking any legislative remedy because we believe that the problem can be solved within the confines of the present legislation.

It has to do with the disposition of Government-owned property acquired by the SBIR contractors during the conduct of the SBIR work. For example, a contractor comes to a close of his phase 2, and he has some equipment, say, a vacuum pump. The vacuum pump is part of his system that he is trying to commercialize. He is trying to find venture capitalists to invest in it, and so forth.

Typically, when a contract comes to a close there are well-defined procedures; what to do with Government-owned property—and, yes; we realize that Public Law 97-219, provides that, when it is cost effective, the title to the property can be transferred to the contractor. However there may be other cases where it is determined that it is not cost effective, and to take this vacuum pump out of the system while the SBIR contractor is trying to commercialize his product, seems not the right way to go.

So, I am very pleased to report to you that my colleagues in DOE's office of procurement policy have essentially worked out a process which will allow the SBIR contractor to maintain the use of the Government-owned property for a limited time while he pursues the effort to commercialize the product of the SBIR Program.

Finally, let me say that we are aware of the requirement in the law for the Secretary of Energy to provide his judgments on the impact of the SBIR Program on the Department's programs. Although the Secretary is expected to provide those judgments to the Comptroller General for about a year, the Department has already undertaken a process of evaluating the SBIR Program from that point of view to provide input to the Secretary. At the same time, I would like to insert a note of caution about seeking instant success stories. Experience has taught us that 2½ years is an extremely short time to expect any indication of commercialization starting from a point where the concept was just at an exploratory stage. So, 2½ years from exploratory stage to commercialization is a very brief time.

We would like to share with you our belief that while we are very optimistic, based on the technical contents of the projects, about the eventual outcome of the program, we would prefer to be very cautious in talking about any success stories. They may be fleeting.

On that note of caution, Mr. Chairman, I would like to end my remarks. I would be glad to answer any questions.

[Dr. Gajewski's prepared statement follows:]

PREPARED STATEMENT OF RYSZARD GAJEWSKI,
SBIR PROGRAM MANAGER, DEPARTMENT OF
ENERGY

Mr. Chairman and Members of the Subcommittee:

It is a pleasure to appear here today to provide comments on the Small Business Innovation Research (SBIR) program at the Department of Energy (DOE).

Over the almost four years of its existence, the SBIR program has matured significantly. We have by now issued four Phase I solicitations, reviewed about four thousand proposals, selected for funding over four hundred Phase I projects and well over one hundred Phase II projects; the first "cycle" of SBIR projects--those initiated for Phase I in FY 1983--has just come to completion. Thus, while it is still too early to attempt a full evaluation of the SBIR program, this may be a very opportune time to share with the Committee some of our experiences in implementing the program.

HIGH TECHNICAL QUALITY

Perhaps the most striking feature of the DOE SBIR program is the high technical quality of projects supported. DOE technical staff involved in proposal review and selection reports overwhelmingly that the weight of the technical contents of our SBIR projects is fully comparable with that of projects supported by the Department outside of SBIR. Quite obviously, most of our SBIR projects differ in nature, as they should, from work funded at universities and national laboratories; in formulating technical topics for inclusion in an SBIR solicitation, we are mindful of the need to attract projects with a potential of going into Phase III. Even so, comparisons of the degree of complexity, innovativeness and technical sophistication between our SBIR and non-SBIR projects can be made, and SBIR projects fare quite well in such comparisons.

MERGING FUNDS

The attainment of high technical quality of SBIR projects has been made possible by adopting the principle of merging contributions made to SBIR by different Departmental elements--contributions oftentimes derived from different appropriations--into a single SBIR fund. Thus we were able to entice the various technical programs into a healthy competition. By submitting well-designed topics for inclusion in the annual SBIR solicitation, and by publicizing the solicitation within the respective technical communities, the various programs can assure that funds contributed to SBIR will return to the respective programs in the form of SBIR-supported Phase I and Phase II projects.

PROGRAM BALANCE

While technical excellence is clearly the primary consideration in the DOE proposal selection process, we also have in place a mechanism which promotes overall program balance without sacrificing quality. Here the objective is to make the technical spectrum of DOE SBIR projects track as closely as possible the spectrum of Departmental priorities. This is accomplished by making the number of technical topics placed in a solicitation roughly proportional to the respective technical program's contribution to the SBIR fund. Accordingly, there is more opportunity to submit proposals in areas which, by Administration policy and Congressional mandate, require stronger emphasis.

Experience has taught us that excellent SBIR proposals can be encouraged in virtually every field of Departmental technical activity, including such seemingly esoteric technical areas as, for example, high energy particle physics. Managers of that program were able to identify

subjects of vital interest to high energy physics which at the same time were most appropriate for SBIR work; examples include innovations in cryogenic technologies, superconducting wire fabrication and accelerator instrumentation. As a result, the high energy physics program, a major contributor to the SBIR program, is getting back the value of its monetary contribution to the SBIR fund in the form of SBIR projects of outstanding quality.

The number of SBIR Phase I proposals has declined from the first-year high of over 1,700 in FY 1983 to approximately 700 in FY 1986. Nevertheless, a thorough technical review of these proposals, conducted within the time constraints mandated by the Small Business Administration (SBA) Policy Directive, requires a highly concentrated effort on the part of many DOE technical staff members. The excellent cooperation on the part of various Departmental elements with the SBIR program provides convincing testimony as to the value of SBIR-selected projects to the DOE technical programs.

SOME VITAL STATISTICS

The accompanying table summarizes some DOE SBIR vital statistics. The following comments pertain to this table:

- o The dollar discrepancy in the FY 1985 column, between the line "Amount Set-Aside for SBIR" and the line "Total Amount Spent on Phase I and Phase II Awards", results from the mechanism by which the SBIR set-aside was assessed. At the beginning of FY 1985, the Department determined the SBIR assessments based on the new budget authority which has been appropriated by Congress. This assessment was based on the amounts for extramural research and development in

VITAL STATISTICS OF THE DOE/SBIR PROGRAM

	<u>FY 1984</u>	<u>FY 1985</u>
Extramural R and D Budget (excluding DOE Defense Programs)	\$2,613,300,000	\$2,522,700,000
Amount Set-Aside for SBIR	\$15,826,000	\$25,227,000
Number of R and D Solicitations	1	1
Number of Phase I Proposals	844	861
Number of Phase I Awards	101	110
Amount Spent on Phase I Awards	\$4,899,201	\$5,416,713
Number of Phase II Proposals	96	91
Number of Phase II Awards	51	46
Amount Spent on Phase II Awards	\$11,493,576*	\$19,309,063**
Total Amount Spent on Phase I and Phase II Awards	\$16,392,777	\$24,725,776
Number of Identified Valid Follow-on Phase III Funding Commitments***	3	4

* Since Phase II awards are almost always funded in two years, this figure represents about half of the total dollars spent on the 51 Phase II projects initiated in FY 1984.

** This figure consists of about half of the total dollars spent on (1) the 51 projects started in FY 1984 and (2) the 46 projects started in FY 1985.

*** See comment on page 5 in the text.

programs other than the Defense Program which, by law, is exempted from participation in the SBIR program. At the end of the fiscal year, the Department determined the actual extramural funds obligated. The shortage in the original assessment will result in an adjustment to the assessment for the next fiscal year. Accordingly, in order to offset the FY 1985 shortfall, the Department will increase its FY 1986 assessment.

- o "Number of Identified Valid Follow-on Phase III Funding Commitments." This number is determined by reviewing follow-on funding commitments only for proposals with lowest fundable merit scores, where the presence of a valid commitment is used as a tie-breaker, as stipulated by Public Law 97-219. The total number of Phase II proposals accompanied by follow-on funding commitments is clearly higher. However, those commitments are not examined unless there is a need to invoke them as tie-breakers.

SOME PROBLEMS

We would like to use this opportunity to bring to the Committee's attention two problems. These are:

Cost of Running SBIR - The SBIR program is highly labor-intensive. The need to process many hundreds of proposals every year and to provide them with a high-quality technical review places a heavy burden on the Department's resources. In addition, the Department engages in a sizeable outreach program: for two consecutive years now we have co-sponsored, with the National Science Foundation, major SBIR-oriented conferences, and we go to numerous meetings throughout the country to help bring the opportunities offered by the SBIR program to the attention of the small business

community. Such activities are presently supported out of program direction funds. It would be most helpful to obtain a favorable interpretation of P.L. 97-219 permitting the use of SBIR program funds for SBIR program support purposes.

Property Acquired Under SBIR Contracts - Public Law 97-219 provides that title to Government-owned property may be transferred to the contractor if such a transfer would be more cost effective than recovery of the property by the agency. Yet, standard Government property regulations do not recognize the unique nature of the SBIR program. Consequently, we are encountering specific instances where the application of Government property regulations could pose a barrier to further development and eventual commercialization of products and processes resulting from SBIR research. For instance, it could be argued that we need to remove a vacuum pump from a bench-scale system developed under SBIR, which would hinder the chances of the contractor attracting non-federal funding to commercialize the system. We are presently working on solutions, consistent with all relevant statutes, that would allow the continued use, for a limited time, of Government-owned property by SBIR participants beyond Phase II in those instances where it can be determined that doing so would foster further development and eventual commercialization of the respective technology.

SBIR PROGRAM EVALUATION

Mindful of the requirement of P.L. 97-219 for the Secretary of Energy to provide to the Comptroller General his judgments as to the effect of the SBIR program on DOE research programs for inclusion in the Comptroller General's report to Congress (due in July of 1987), we are presently undertaking a review of the DOE SBIR program. In doing so, we recognize from

experience that typically it takes many years to bring a technical innovation from the stage of exploratory research to commercialization. Thus, a great deal of patience needs to be exercised; while there very well may be some "success stories" shortly following the 2 1/2 years of SBIR funding, the real, significant accomplishments may not materialize until several years later. Accordingly, while the high technical quality of our SBIR projects gives us every reason to be optimistic about the program's eventual outcome, we must be careful to avoid the temptation either to seek "instant successes" that may be fleeting, or to make rush judgments about the commercialization resulting from SBIR research, where the time to accomplish commercialization clearly has been insufficient.

Mr. Chairman, that concludes my testimony. I would be happy to answer any questions.

Mr. SISISKY. Thank you very much, Dr. Gajewski.
Did you have any questions, Mr. Conte?

Mr. CONTE. No.

Mr. SISISKY. Would the Department of Energy, in your opinion, utilize small business to perform research and development tasks to the same extent without the SBIR Program?

Dr. GAJEWSKI. The Department of Energy contains a very broad mix of programs, and historically some of those programs have utilized the small business sector very significantly. Some other programs have not done so.

I believe that one very, very evident effect of the SBIR Program is that it has brought to the attention of many programs, which in the past have not utilized small business as a resource, the very significant resources that reside in that sector. It is very hard to speculate as to what would happen if there were no SBIR Program.

Mr. SISISKY. Of course you must know that you had an increase in the use of small businesses with the SBIR Program, have you seen a great acceleration of the use of small business?

Dr. GAJEWSKI. That is right.

Mr. SISISKY. So that would really answer the question. I am not trying to put words in your mouth, but—

Dr. GAJEWSKI. There is no doubt that the presence of the SBIR Program has increased the number of small businesses that are used in research and development work in the Department of Energy.

Mr. CONTE. Would you yield?

Mr. SISISKY. Sure.

Mr. CONTE. Did you have anybody in charge of similar programs before we passed the SBIR law, in your Agency.

Dr. GAJEWSKI. There was no similar program in our Agency before.

Mr. SISISKY. Are you familiar with H.R. 4260, which would repeal the sunset provision?

Dr. GAJEWSKI. Yes.

Mr. SISISKY. Do you have any comments you would like to add? Would you support or would the Department of Energy support; or would you care to find out from your agency? We will keep the record open for a week.

Dr. GAJEWSKI. I would be glad to find out.

Mr. SISISKY. I think it is unfair to ask you for a policy decision on behalf of the Department of Energy. However, I would like to know what is the Department's policy.

[The information follows:]

While the Department of Energy would prefer to reserve final judgment on the effectiveness of SBIR until such time that the program could be fully evaluated, we know that this may very well take several more years. In the meantime, the program should be allowed to proceed. Accordingly, the Department of Energy would not object to extension of the SBIR Program.

Mr. SISISKY. You talked about Government-owned property, and I could see where that would be a problem. And you also talked about you have halfway solved the problem by allowing them to use the property for a limited time; what do you mean by limited time?

Dr. GAJEWSKI. Well, this is still under discussion. For one thing, I believe that they should be allowed to use the equipment while they are actively seeking phase 3 funding.

How long after phase 2 has expired should they be allowed to use the equipment while seeking phase 3? It is not obvious. I would say, certainly, not less than half a year, maybe 9 months, probably not more than 1 year.

You have to say at some point we are unable to find phase 3 funding.

Mr. SISISKY. Have we tried to sell it to the small business owner?

Dr. GAJEWSKI. Yes; that would be an option.

Mr. SISISKY. Rather than take the equipment back and put it in a warehouse, it would seem to me——

Dr. GAJEWSKI. That is exactly right.

Mr. SISISKY. How much time do you believe is needed to assess the full value and potential of SBIR projects; you caution it is still too early to make an assessment. When do you think you will know the results?

Dr. GAJEWSKI. Mr. Chairman, that is an awfully tough question to answer. One can go by experience. And if I had to go by my own experience, I would say, 6 years, perhaps; 8 years, probably; in 10 years we should really know something. So that is the range.

Mr. SISISKY. But I assume from your testimony that the Department of Energy is very satisfied, in general with the SBIR Program.

Dr. GAJEWSKI. Yes; that is right.

Mr. SISISKY. I think that you have testified that you have seen some good things materialize from the program. Are you satisfied with the type of research?

Dr. GAJEWSKI. Absolutely.

Mr. SISISKY. I do appreciate your testifying today.

Dr. GAJEWSKI. I appreciate the opportunity.

Mr. SISISKY. Our next witness is Dr. Leo Young, the Director for Research and Laboratory Management, Office of the Deputy Under Secretary of Defense, in the Department of Defense.

Welcome, Dr. Young, we appreciate your being here this morning. You may proceed in any way you so desire.

I think you are accompanied by Mr. Horace Crouch, who is the Deputy Director, Office of Small and Disadvantaged Business Utilization, and Mr. Nelson Eaton, Director, Research and Development, Office of the Secretary of Defense.

I am not used to seeing you gentlemen here in the Small Business Committee; I am used to seeing you in the Armed Services Committee.

I welcome you, anyway; you may proceed.

TESTIMONY OF LEO YOUNG, DIRECTOR, RESEARCH AND LABORATORY MANAGEMENT, OFFICE OF DEPUTY UNDER SECRETARY OF DEFENSE, ACCOMPANIED BY HORACE CROUCH, DEPUTY DIRECTOR, OFFICE OF SMALL AND DISADVANTAGED BUSINESS UTILIZATION, AND NELSON EATON, DIRECTOR, RESEARCH AND DEVELOPMENT

Dr. YOUNG. Thank you, Mr. Chairman, it is a pleasure to see you in another forum for a change. I am Leo Young. On my left is Mr. Horace Crouch, and on my right is Mr. Nelson Eaton. I am very pleased to be here this morning to discuss the implementation of and the experience thus far with the DOD Small Business Innovation Research Program.

I have a written statement which I would like to submit for the record.

Mr. SISISKY. Without objection it will be included in the record.

Dr. YOUNG. Public Law 97-219, the Small Business Innovation Development Act of 1982, required that beginning in fiscal year 1983, the Department of Defense make available a specified percentage of its extramural research and development budget to small high technology companies competing in the Small Business Research Innovation Program.

The required percentages rose from 0.1 percent in fiscal year 1983, to 1 percent this year, and it will go to 1.25 percent next year. The execution of the SBIR Program in DOD is decentralized. The Army, Navy, Air Force, the Defense Advanced Research Projects Agency, known as DARPA, and the Defense Nuclear Agency [DNA], and since 1985, the Strategic Defense Initiative Organization, independently select the research and development and topics which are published in the SBIR solicitation brochure, the single brochure from DOD.

They review the proposals received in response to the advertised topics and they select the winning proposals. I provide direction, oversight, coordination for the program through the Defense Small Business Innovation Committee, of which I am the Chairman, and Mr. Crouch, on my left here, is the Deputy Chairman.

The Committee is comprised of representatives from the services and all the defense agencies that participate in the program. The Defense Technical Information Center, DTIC, plays a vital role in

strengthening proposal submissions to SBIR, by providing special technical information support to potential offerors.

In addition to DTIC services, small business firms interested in participating in the SBIR Program may also seek general administrative guidance from small business specialists located in various defense contract administration services activities throughout the United States.

Projected funding requirements for the SBIR Program are based on DOD research and development budget categories 6.1, basic research; 6.2, exploratory development; 6.3, advanced development; 6.4, engineering development; and 6.5, management and support. Since there are considerable differences across this spectrum of R&D activities, it was decided at the outset of the SBIR Program that each budget category representing a different R&D activity should contribute the same percentage of its allocation to the SBIR Program.

The DOD excluded operational systems development from the SBIR funding base, because this form of development applies to weapon systems already approved for deployment, or already in production. Production and operation use of weapons systems often uncover deficiencies and make corrected design changes necessary for adequate systems performance.

These changes often have to be made as expeditiously as possible and within the limits imposed by the overall system requirements. Hence, these improvements are best made by the already existing working team of contractor and DOD personnel in the normal course of maximizing system performance.

For the same reason also, funds for operational systems development never come out of budget category 6, which applies only to preproduction R&D, even though the efforts are reported under Title II without distinction as to preproduction or in-production R&D. Bringing in new contractors to alter a system already in production would in all likelihood cause unnecessary delays, would create interface and integration problems with the other related weapons and support systems, and would increase costs.

Let me give you an example. Suppose that a particular type of aircraft developed an operational defect, which causes all such planes to be grounded. Time becomes a most important factor in getting these airplanes back in service. We return to the original manufacturer, where work on the modifications could begin immediately, without delay.

Lead time for beginning work on the modification through the SBIR solicitation would be upward of 1 year, which is unacceptable in such a case, therefore, for purposes of compliance with the intent of the SBIR Act, DOD excludes the operational systems development funds from the baseline on calculations.

This is entirely consistent with the recognized primary purpose for DOD appropriations, to provide and maintain an adequate national security, while at the same time taking advantage of the innovative contribution of American small business.

The DOD strongly supports the objectives of the SBIR Act, and has exceeded or met the annual goals for the SBIR Program, in fiscal year 1983, 1984, and 1985. During the first 3 years of the

SBIR Program, fiscal year 1983-85, the DOD expended more than \$149 million on 1,194 phase 1; and 329 phase 2 projects.

These funded projects were selected from 9,000 proposals submitted on 1,500 topics announced in three annual phase 1 solicitations.

The DOD SBIR budget for fiscal year 1986, is estimated to be more than \$150 million. One-third of this amount will be used to fund approximately, 850 selections from the 5,000 proposals received in response to the fiscal year 1986 phase 1 solicitation.

The remaining two-thirds of the budget will be used to fund new and continuing phase 2 projects selected from the fiscal year 1983, 1984, and 1985 phase 1 awards. As you can see the DOD SBIR Program has come a long way since the early days. We are enthusiastic about the program and feel it has been a real benefit to DOD while also providing valuable new opportunities for small business.

The DOD has long been sensitive to the needs of small business. The voluntary DESAT Program that preceded the SBIR Act, is an example of DOD early activity to increase the participation of small R&D firms of this Nation in the innovative process. It is our view that the current act is fundamentally sound, is working well, and should continue for the immediate future.

Mr. Chairman, we appreciate the opportunity to testify on the Small Business Innovation Program. We are proud of what DOD and its small business contractors have accomplished by working together in almost 6 years of SBIR and DESAT programs.

Thank you very much.

[Dr. Young's prepared statement follows:]

PREPARED STATEMENT OF LEO YOUNG, DIRECTOR,
RESEARCH AND LABORATORY MANAGEMENT, OFFICE
OF THE DEPUTY UNDER SECRETARY OF DEFENSE

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:

I AM LEO YOUNG, DIRECTOR FOR RESEARCH AND LABORATORY MANAGEMENT IN THE OFFICE OF THE DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ADVANCED TECHNOLOGY. THIS MORNING I WILL DISCUSS THE IMPLEMENTATION OF AND THE EXPERIENCE THUS FAR WITH THE DOD SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM, ESTABLISHED IN ACCORDANCE WITH P.L. 97-219. I HAVE WITH ME HORACE CROUCH, DEPUTY DIRECTOR OF THE OFFICE OF SMALL AND DISADVANTAGED BUSINESS UTILIZATION AND NELSON EATON, DIRECTOR, RESEARCH AND DEVELOPMENT IN THE OFFICE OF THE DEPUTY ASSISTANT SECRETARY OF DEFENSE (PROGRAM/BUDGET).

THE DEPARTMENT OF DEFENSE RECOGNIZES THAT THE CAPABILITIES AND EXPERIENCE OF SMALL BUSINESS IN HIGH TECHNOLOGY AREAS CAN AND HAVE MADE A VALUABLE CONTRIBUTION TO THE RESEARCH AND DEVELOPMENT REQUIREMENTS OF DOD. A VOLUNTARY PROGRAM TO ENCOURAGE DOD-RELATED RESEARCH AND DEVELOPMENT IN SMALL FIRMS WAS INSTITUTED IN FY 1982: THE DEFENSE SMALL BUSINESS ADVANCED TECHNOLOGY (DESAT) PROGRAM. THE NATIONWIDE ANNOUNCEMENT OF THE DESAT PROGRAM RESULTED IN 1100 PROPOSALS OF WHICH 100 PHASE I AWARDS WERE MADE FOR A TOTAL OF \$5.0 MILLION IN FY 1982. OF THE PHASE I WINNERS, 33 WERE SELECTED FOR PHASE II AWARDS FOR A TOTAL OF \$4.8 MILLION IN FY 1983, \$5.0 MILLION IN 1984 AND \$1.9 MILLION IN 1985. TWO DESAT PROJECTS HAVE PROVIDED INNOVATIVE TECHNOLOGY USEFUL TO DOD NEEDS AND ARE CURRENTLY BEING FUNDED IN PHASE III BY DOD WITH NON-SBIR FUNDS. THE SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM LEGISLATED

IN THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT OF 1982 CLOSELY RESEMBLES THE DESAT PROGRAM. THIS GAVE DOD A RUNNING START AND RESULTED IN A SMOOTH TRANSITION FROM DESAT TO SBIR.

THE EXECUTION OF THE SBIR PROGRAM IN DOD IS DECENTRALIZED. THE ARMY, NAVY, AIR FORCE, DEFENSE ADVANCED RESEARCH PROJECTS AGENCY (DARPA), DEFENSE NUCLEAR AGENCY (DNA), AND THE STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO JOINED THE SBIR PROGRAM IN FY 1985) INDEPENDENTLY SELECT THE RESEARCH AND DEVELOPMENT TOPICS WHICH ARE PUBLISHED IN THE SBIR SOLICITATION BROCHURE, REVIEW PROPOSALS RECEIVED IN RESPONSE TO THE ADVERTISED TOPICS, AND SELECT THE WINNING PROPOSALS. I PROVIDE DIRECTION, OVERSIGHT AND COORDINATION FOR THE PROGRAM THROUGH THE DEFENSE SMALL BUSINESS INNOVATION RESEARCH COMMITTEE (DESIC), OF WHICH I AM CHAIRMAN AND MR. CROUCH IS DEPUTY CHAIRMAN. THE COMMITTEE IS COMPRISED OF REPRESENTATIVES FROM THE SERVICES AND DEFENSE AGENCIES.

THE PRIMARY FUNCTIONS OF THE COMMITTEE ARE TO ACT AS OVERALL FOCAL POINT FOR SBIR; TO ENSURE COORDINATION AMONG THE DOD AGENCIES; TO COLLECT RESEARCH TOPIC DESCRIPTIONS AND PUBLISH THE SOLICITATION BROCHURES; TO PUBLICIZE THE PROGRAM WITHIN THE SMALL BUSINESS COMMUNITY; AND TO COLLECT DATA REQUIRED TO EVALUATE THE PROGRAM AND TO PREPARE MANDATED REPORTS. THE MEETINGS OF THE DESIC COMMITTEE PROVIDE A FORUM FOR THE PARTICIPATING AGENCIES TO DISCUSS COMMON ISSUES WHICH ARISE AND TO ENSURE CONSISTENCY IN IMPLEMENTATION OF THE PROGRAM AMONG THE AGENCIES.

THE SERVICES AND DEFENSE AGENCIES DETERMINE THEIR SBIR RESEARCH TOPICS INDEPENDENTLY ACCORDING TO THEIR CURRENT TECHNOLOGY NEEDS AND REQUIREMENTS. THE TOPIC DESCRIPTIONS ARE COLLECTED BY THE OFFICE OF THE SECRETARY OF DEFENSE AND INTEGRATED INTO A SINGLE SBIR SOLICITATION BROCHURE. PRIOR TO RELEASE OF THIS DOCUMENT, THE SMALL BUSINESS ADMINISTRATION IS GIVEN THE LIST OF TOPICS FOR PUBLICATION IN ITS NEXT QUARTERLY PRESOLICITATION ANNOUNCEMENT.

THE SOLICITATION BROCHURE IS DISTRIBUTED WIDELY BY DIRECT MAILINGS USING THE SBA SBIR SOURCE LIST. IN ADDITION, THE PROGRAM IS ADVERTISED IN R&D TRADE ASSOCIATION MAGAZINES AND APPEARS ON THE FRONT PAGE OF THE COMMERCE BUSINESS DAILY. REQUESTS FOR BROCHURES ARE DIRECTED TO THE DEFENSE TECHNICAL INFORMATION CENTER. FINALLY, DOD REPRESENTATIVES ATTEND SPECIAL CONFERENCES FOR SMALL FIRMS ORGANIZED BY SBA, NSF, MEMBERS OF CONGRESS, AND THE STATES. MORE THAN 100 SUCH CONFERENCES HAVE BEEN ATTENDED BY DOD REPRESENTATIVES SINCE THE PROGRAM BEGAN IN 1983. FOR THE SOLICITATIONS RELEASED FROM 1983 TO 1986, A TOTAL OF APPROXIMATELY 150,000 BROCHURES WERE DISTRIBUTED, 100,000 BY MAILINGS AND 50,000 MORE AT CONFERENCES.

THE DEFENSE TECHNICAL INFORMATION CENTER (DTIC) PLAYS A VITAL ROLE IN STRENGTHENING PROPOSAL SUBMISSIONS TO SBIR BY PROVIDING SPECIAL TECHNICAL INFORMATION SUPPORT TO POTENTIAL OFFERORS. DTIC ASSEMBLES A PACKAGE OF BIBLIOGRAPHIC CITATIONS OF UNCLASSIFIED TECHNICAL REPORTS AND DESCRIPTIONS OF CURRENT DOD-SPONSORED R&D

PROGRAMS FOR EACH TOPIC APPEARING IN THE SOLICITATION BROCHURE. DTIC ALSO WILL PROVIDE COPIES OF PARTICULAR REPORTS APPEARING IN THE BIBLIOGRAPHIES ON REQUEST. SBIR PARTICIPANTS ARE GIVEN ACCESS TO DTIC MANAGED INFORMATION ANALYSIS CENTERS (IACS) WHICH PROVIDE INFORMATIONAL AND CONSULTATIVE SERVICES IN SPECIALIZED R&D AREAS. DURING THE MOST RECENT SBIR SOLICITATION PERIOD WHICH CLOSED JANUARY 31, 1986, DTIC PROVIDED 28,477 TECHNICAL INFORMATION PACKAGES AND 15,081 COPIES OF TECHNICAL REPORTS TO 3,031 SMALL FIRMS RESPONDING TO 760 SOLICITATION TOPICS. BY PROVIDING THIS CAREFULLY TAILORED TECHNICAL INFORMATION, DTIC PERFORMS A KEY SERVICE FOR BOTH DOD AND THE SMALL BUSINESS COMMUNITY. THE WASTED EFFORT AND COST ASSOCIATED WITH PREPARATION OF PROPOSALS WHICH DUPLICATE COMPLETED OR ON-GOING R&D IS REDUCED, WHILE OTHER PROPOSALS WHICH MAY INCORPORATE RESULTS OF PREVIOUS, RELATED RESEARCH ARE STRENGTHENED.

IN ADDITION TO DTIC SERVICES, SMALL BUSINESS FIRMS INTERESTED IN PARTICIPATING IN THE SBIR PROGRAM MAY ALSO SEEK GENERAL ADMINISTRATIVE GUIDANCE FROM SMALL BUSINESS SPECIALISTS LOCATED IN VARIOUS DEFENSE CONTRACT ADMINISTRATION SERVICES (DCAS) ACTIVITIES THROUGHOUT THE UNITED STATES. THESE SPECIALISTS, IDENTIFIED IN THE SOLICITATION BROCHURE, ARE AVAILABLE TO DISCUSS GENERAL ADMINISTRATIVE REQUIREMENTS TO FACILITATE THE SUBMISSION OF PROPOSALS AND EASE THE ENTRY OF THE SMALL HIGH TECHNOLOGY BUSINESS INTO THE DEPARTMENT OF DEFENSE MARKETPLACE.

THE PROCESS OF SBIR PROPOSAL EVALUATION AND SELECTION OF WINNING PROPOSALS IS SIMILAR AMONG THE SERVICES AND DEFENSE AGENCIES. PHASE I PROPOSALS IN EACH TOPIC AREA ARE EVALUATED ON A COMPETITIVE BASIS WITHIN THE ORGANIZATION WHICH GENERATED THE TOPIC. THE PROPOSALS ARE FIRST SCREENED TO ELIMINATE THOSE WHICH OBVIOUSLY ARE NOT RELEVANT TO THE CHOSEN TOPIC. THE REMAINDER IN EACH TOPIC AREA ARE EVALUATED BY SCIENTISTS AND ENGINEERS KNOWLEDGEABLE IN THAT AREA.

FINAL DECISIONS ON FUNDING ARE MADE INDEPENDENTLY BY THE PARTICIPATING AGENCIES BASED ON THE TECHNICAL EVALUATION ALONG WITH CONSIDERATION OF OTHER FACTORS, INCLUDING POSSIBLE DUPLICATION BY OTHER ONGOING WORK AND THE OVERALL R&D PROGRAM BALANCE. CONTRACT NEGOTIATION FOR A SUCCESSFUL PROPOSAL IS CARRIED OUT BY THE LOCAL CONTRACTING OFFICE NORMALLY USED BY THE DOD ORGANIZATION WHICH PERFORMED THE TECHNICAL EVALUATION.

PHASE II PROPOSALS ARE SUBMITTED ONLY BY WINNERS OF PHASE I AWARDS; THERE IS NO PHASE II SOLICITATION. ALSO, PHASE I WINNERS ARE NOT GUARANTEED PHASE II AWARDS. DETAILED INSTRUCTIONS REGARDING PHASE II PROPOSAL SUBMISSION ARE SENT BY DOD COMPONENTS TO ALL OF THEIR PHASE I AWARD WINNERS.

PHASE II PROPOSALS ARE SUBJECTED TO A TECHNICAL REVIEW PROCESS SIMILAR TO THAT FOR PHASE I. FINAL DECISIONS ARE MADE BY DOD COMPONENTS BASED UPON SCIENTIFIC AND TECHNICAL MERIT AND POSSIBLY

PHASE III FOLLOW-ON FUNDING COMMITMENT (NON-SBIR FUNDING), THE AVOIDANCE OF DUPLICATION WITH OTHER RESEARCH AND DEVELOPMENT EFFORTS, AND PROGRAM BALANCE.

PUBLIC LAW 97-219, THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT OF 1982, REQUIRED THAT THE DOD MAKE AVAILABLE THE FOLLOWING PERCENTAGES OF ITS EXTRAMURAL R&D BUDGET FOR THE SBIR PROGRAM BEGINNING WITH THE FISCAL YEAR 1983:

TABLE I

DOD EXTRAMURAL R&D BUDGET PERCENTAGES
AND TOTAL R&D SET-ASIDES FOR SMALL BUSINESS

	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985</u>	<u>FY 1986</u>	<u>FY 1987</u>	<u>FY 1988*</u>
Total Extramural R&D Budget	\$13.678B	\$15.665B	\$16.276B	-	-	-
Percentage	0.10	0.30	0.50	1.00	1.25	1.25
Estimated Dollars	\$16.7M	\$43.0M	\$79.0M	\$160.0M	\$204.0M	\$262.0M
Actual Awarded Dollars	\$20.6M	\$44.6M	\$78.2M**	-	-	-
Total R&D Set Aside for Small Business	\$105.5M	\$172.8M	\$295.8M	-	-	-

* FY 1988 NUMBERS ARE ONLY FOR PLANNING PURPOSES.

** ON JANUARY 16, 1986 THERE WAS A 5.039 PERCENT DEFERRAL OR REDUCTION ON THE FY 1985 UNOBLIGATED FUNDS OF ALL PROGRAMS, PROGRAM ELEMENTS, PROJECTS, AND ACTIVITIES BASED ON THE GRAMM/RUDMAN/HOLLINGS BILL. THE DOD SBIR BUDGET FOR FY 1985 WAS REDUCED BY \$1.8 MILLION. OMB BULLETIN 86-7, 16 JAN 86.

PROJECTED FUNDING REQUIREMENTS FOR THE SBIR PROGRAM ARE BASED ON DOD'S RESEARCH AND DEVELOPMENT BUDGET CATEGORIES 6.1 (BASIC RESEARCH), 6.2 (EXPLORATORY DEVELOPMENT), 6.3 (ADVANCED DEVELOPMENT), 6.4 (ENGINEERING DEVELOPMENT), AND 6.5 (MANAGEMENT AND SUPPORT). SINCE THERE ARE CONSIDERABLE DIFFERENCES ACROSS THIS SPECTRUM OF R&D ACTIVITIES, IT WAS DECIDED AT THE OUTSET OF THE SBIR PROGRAM THAT EACH BUDGET CATEGORY, REPRESENTING A DIFFERENT R&D ACTIVITY, SHOULD CONTRIBUTE THE SAME PERCENTAGE OF ITS ALLOCATION TO THE SBIR PROGRAM.

THE DOD EXCLUDED OPERATIONAL SYSTEMS DEVELOPMENT FROM THE SBIR FUNDING BASE BECAUSE THIS FORM OF DEVELOPMENT APPLIES TO WEAPONS SYSTEMS ALREADY APPROVED FOR DEPLOYMENT OR ALREADY IN PRODUCTION. PRODUCTION AND OPERATIONAL USE OF WEAPONS SYSTEMS OFTEN UNCOVER DEFICIENCIES AND MAKE CORRECTIVE DESIGN CHANGES NECESSARY FOR ADEQUATE SYSTEMS PERFORMANCE. THESE CHANGES OFTEN HAVE TO BE MADE AS EXPEDITIOUSLY AS POSSIBLE AND WITHIN THE LIMITS IMPOSED BY THE OVERALL SYSTEM REQUIREMENTS. HENCE THESE IMPROVEMENTS ARE BEST MADE BY THE ALREADY EXISTING WORKING TEAM OF CONTRACTOR AND DOD PERSONNEL IN THE NORMAL COURSE OF MAXIMIZING SYSTEM PERFORMANCE. FOR THE SAME REASON ALSO, FUNDS FOR OPERATIONAL SYSTEMS DEVELOPMENT NEVER COME OUT OF BUDGET CATEGORY 6, WHICH APPLIES ONLY TO PRE-PRODUCTION R&D, EVEN THOUGH THE EFFORTS ARE REPORTED UNDER TITLE II WITHOUT DISTINCTION AS TO PRE-PRODUCTION OR IN-PRODUCTION R&D.

BRINGING IN A NEW SUPPLIER TO ALTER A SYSTEM ALREADY IN PRODUCTION WOULD IN ALL LIKELIHOOD CAUSE UNNECESSARY DELAYS, WOULD CREATE INTERFACE AND INTEGRATION PROBLEMS WITH THE OTHER RELATED WEAPON AND SUPPORT SYSTEMS, AND WOULD INCREASE COSTS. THE ALTERNATIVE OF CALCULATING DOLLARS BY MECHANICALLY APPLYING THE SBIR PERCENTAGE TO OPERATIONAL SYSTEMS DEVELOPMENT FUNDS, AND THEN TAXING PROGRAM 6 ACTIVITIES BECAUSE OF THE IMPRACTICALITY OF USING OPERATIONAL SYSTEMS DEVELOPMENT FUNDS FOR SBIR PURPOSES, WAS CONSIDERED BUT DISCARDED. IT DID NOT SEEM TO MEET THE INTENT OF THE LAW, NAMELY THE OPENING UP WHEREVER POSSIBLE OF NEW BUSINESS OPPORTUNITIES TO SMALL BUSINESS.

THEREFORE, FOR PURPOSES OF COMPLIANCE WITH THE INTENT OF THE SBIR ACT, DOD EXCLUDES THE OPERATIONAL SYSTEMS DEVELOPMENT FUNDS FROM THEIR BASELINE CALCULATIONS. THIS IS ENTIRELY CONSISTENT WITH THE RECOGNIZED PRIMARY PURPOSE FOR DOD APPROPRIATIONS -- TO PROVIDE AND MAINTAIN AN ADEQUATE NATIONAL SECURITY -- WHILE AT THE SAME TIME TAKING ADVANTAGE OF THE INNOVATIVE CONTRIBUTION OF AMERICAN SMALL BUSINESS. THE DOD STRONGLY SUPPORTS THE OBJECTIVES OF THE SBIR ACT AND HAS EXCEEDED OR MET THE ANNUAL GOALS FOR THE SBIR PROGRAM IN FY 1983, FY 1984, AND FY 1985.

THE TABLE BELOW CONTAINS DOD PERFORMANCE DATA FOR FY 1983 THROUGH FY 1986:

TABLE II

FY 1983 - FY 1986 SBIR PROGRAMS

<u>FY</u>	<u>Phase I Proposals Received</u>	<u>Phase I Awards Made</u>	<u>Funds Awarded</u>	<u>Average Amount Awarded</u>	<u>Phase II Awards</u>
83	2902	283	\$15.795M	\$56.0K	152
84	3012	369	\$19.405M	\$52.5K	144
85	3517	516*	\$28.010M	\$54.2K	-
86	5187	-	-	-	-

FOR THE INITIAL YEAR OF THE DOD SBIR PROGRAM, FY 1983, THE REQUIRED FUNDING FOR DOD WAS 0.1 PERCENT OF THE EXTRAMURAL BUDGET OF \$13.678 BILLION. THE SERVICES, DARPA, AND DNA SELECTED 406 RESEARCH AND DEVELOPMENT TOPICS WHICH WERE INCLUDED IN THE ANNUAL SBIR SOLICITATION BROCHURE. TABLE II SHOWS THE BREAKOUT OF THE PROPOSALS RECEIVED, AWARDS MADE, AND ASSOCIATED FUNDING LEVELS OF PHASE I AWARDS. COUNTING THE PHASE II DESAT AWARDS OF \$4.8 MILLION TOTAL AWARDS CREDITED TO THE FY 1983 PROGRAM AMOUNTED TO \$20.6 MILLION. THESE AWARDS SUBSTANTIALLY EXCEEDED OUR ESTIMATED, MANDATORY FUNDING LEVEL OF \$16.7 MILLION. SUBSEQUENTLY PHASE I CONTRACTS THAT BEGAN IN FY 1983 RESULTED IN 171 PHASE II PROPOSALS; 152 OF THESE WERE FUNDED OUT OF THE FY 1984 AND FY 1985 SBIR APPROPRIATIONS.

* 26 ADDITIONAL AWARDS WILL BE FUNDED BY THE ARMY WITH FY 1986 FUNDS.

IN A FURTHER EFFORT TO STRENGTHEN THE PROGRAM, DTIC GAVE SUBSTANTIAL ASSISTANCE TO MORE THAN HALF OF THE FY 1983 PHASE I Awardees BY PROVIDING TO THE PRINCIPAL INVESTIGATORS NARROWLY TARGETED AND MORE COMPLETE TECHNICAL REPORT BIBLIOGRAPHIES AND ONGOING RESEARCH SUMMARIES ON THEIR PROJECT TOPICS. SUCH INFORMATION REDUCED THE CHANCE OF UNNECESSARY DUPLICATION OF PRIOR OR ON-GOING RESEARCH AND DEVELOPMENT WORK AND HELPED ESTABLISH COMMUNICATION AMONG INVESTIGATORS WORKING ON RELATED PROJECTS. THIS SERVICE HAS CONTINUED FOR BOTH PHASE I AND PHASE II AWARD WINNERS.

DURING THE SECOND YEAR OF THE DOD SBIR PROGRAM, FY 1984, THE DOD WAS REQUIRED TO MAKE AVAILABLE 0.3 PERCENT (\$43M) OF ITS EXTRA-MURAL RESEARCH AND DEVELOPMENT BUDGET (\$15.665 BILLION) FOR THE SBIR PROGRAM. THE SERVICES, DARPA, AND DNA DEVELOPED 565 RESEARCH AND DEVELOPMENT TOPICS, WHICH WERE ANNOUNCED IN THE ANNUAL SOLICITATION BROCHURE. THE BREAKOUT OF PROPOSALS RECEIVED, SELECTED AND ASSOCIATED FUNDING LEVELS FOR PHASE I AWARDS WERE ALSO SHOWN IN TABLE II.

ADDITIONAL FY 1984 DOLLARS IN THE AMOUNT OF \$21.786 MILLION WERE USED FOR FIRST-YEAR FUNDING OF 115 PHASE II PROJECTS FROM THE FY 1983 PROGRAM. DOD ALSO AWARDED \$3.062 MILLION TO PHASE II DESAT PROJECTS MAKING TOTAL FOR ALL PHASE I AND PHASE II AWARDS IN FY 1984 AMOUNT TO \$44.584 MILLION. PHASE II AWARDS RESULTING FROM THE FY 1984 PHASE I AWARDS WILL BE FUNDED FROM THE FY 1985 AND FY 1986 SBIR BUDGETS.

IN FY 1985 THE DOD REQUIREMENT FOR FUNDING THE SBIR PROGRAM INCREASED TO 0.5 PERCENT (\$79M) OF ITS EXTRAMURAL RESEARCH AND DEVELOPMENT BUDGET (\$16.276B). THE STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO) JOINED THE SERVICES, DARPA, AND DNA IN ANNOUNCING 509 TOPICS IN THE ANNUAL SOLICITATION BROCHURE. TABLE II REFLECTS THE PROPOSALS RECEIVED, AND THE PHASE I AWARDS MADE. IN ADDITION, THE DOD IS FUNDING 267 PHASE II PROJECTS FROM THE FY 1983 AND FY 1984 PROGRAMS WITH \$48.3 MILLION. THE DOD ALSO AWARDED \$1.9 MILLION TO PHASE II DESAT PROJECTS.

THE DOD SOLICITATION BROCHURE FOR FY 1986 CONTAINED 760 TOPICS BY THE SERVICES, DARPA, DNA, AND SDIO. FROM THE MORE THAN 5,000 PROPOSAL RECEIVED IN RESPONSE TO THIS SOLICITATION, APPROXIMATELY 850 WILL BE FUNDED AS PHASE I CONTRACTS. THE WINNING PROPOSALS WILL BE FORMALLY ANNOUNCED BY SECRETARY WEINBERGER DURING AUGUST 1986.

THE SBIR PROGRAM HAS COME A LONG WAY SINCE THE EARLY DAYS OF THE DESAT PROGRAM IN DOD. WE ARE ENTHUSIASTIC ABOUT THE PROGRAM AND FEEL IT HAS BEEN OF REAL BENEFIT TO DOD, WHILE ALSO PROVIDING VALUABLE NEW OPPORTUNITIES FOR SMALL BUSINESS. TO MAXIMIZE THESE OPPORTUNITIES THE DEFENSE TECHNICAL INFORMATION CENTER HAS GREATLY ASSISTED BY PROVIDING TIMELY AND RELEVANT TECHNICAL INFORMATION TO POTENTIAL SBIR BIDDERS.

THE DOD HAS LONG BEEN SENSITIVE TO THE NEEDS OF SMALL BUSINESS. THE VOLUNTARY DESAT PROGRAM THAT PRECEDED THE SBIR ACT IS AN EXAMPLE OF EARLY DOD ACTIVITY TO INCREASE THE PARTICIPATION OF SMALL R&D FIRMS OF THIS NATION IN THE INNOVATIVE PROCESS. IT IS OUR VIEW THAT THE CURRENT ACT IS FUNDAMENTALLY SOUND, IS WORKING WELL, AND SHOULD CONTINUE FOR THE IMMEDIATE FUTURE.

MR. CHAIRMAN, WE APPRECIATE THE OPPORTUNITY TO TESTIFY ON THE SMALL BUSINESS INNOVATION DEVELOPMENT PROGRAM. WE ARE PROUD OF WHAT DOD AND ITS SMALL BUSINESS CONTRACTORS HAVE ACCOMPLISHED BY WORKING TOGETHER IN ALMOST SIX YEARS OF SBIR AND DESAT PROGRAMS.

- THANK YOU -

Mr. SISISKY. Thank you. On page 7, let me understand how much money you have been using there? Do you follow where I am?

Dr. YOUNG. You would like me to explain table 1?

Mr. SISISKY. Yes; the amount of money that the Department of Defense—and I assume the last full year documented is 1985?

Dr. YOUNG. Right. The number of dollars in 1983, as it shows in this table, is just over \$16 million. Going to \$43 million in 1984; and \$79 million in 1985, and it is expected to go to \$160 million in 1986. Now this does not count the DESAT Program which preceded SBIR in 1982, which I believe was about \$5 million, and is not shown on the table. We are slightly ahead of the total funding required by the law if you count the DESAT Program. We are almost exactly on line.

Mr. SISISKY. What is the total R&D budget, if I am not mistaken, \$30 billion?

Dr. YOUNG. What is counted is the total extramural budget with the exception of the intelligence agencies. Let's see, if you look at the numbers at the top, the total extramural budget is what is shown up here; if you apply these percentages after you have taken away the intelligence part, this should work out.

Mr. SISISKY. Would that include SDI, also?

Dr. YOUNG. Yes; indeed.

Mr. SISISKY. Well, it certainly doesn't seem like a lot of money of the total budget. Maybe I am mistaken—

Dr. YOUNG. Let me make it very clear. This, the extramural budget, this is the contract dollars, this is not the total budget.

Mr. SISISKY. OK.

Dr. YOUNG. I believe roughly, 70 percent goes in contracts.

Mr. SISISKY. Tell me what is the total for 1985 of the SBIR Program?

Dr. YOUNG. The SBIR Program in 1985 is estimated to come to \$79 million here. Now, that is one half a percent. So if you multiply—

Mr. SISISKY. Half a percent of what?

Dr. YOUNG. OK, if you multiply this by 200, you come just about with the number at the top, which is the contract program, the extramural R&D budget; this is the 6.1, 6.2, up to 6.5, budget, which is on the order of the 1985—I don't know the exact number—but I would say the extramural R&D is on the order of \$25 billion. I don't have the exact number with me.

Mr. SISISKY. I think it is a little more than that, if you add in SDI. That is why I am saying it seems like a very small amount of money to me. I thought you talked about 1.25 percent—

Dr. YOUNG. No; it is half a percent in 1985 that we are talking about.

Mr. SISISKY. A half a percent?

Dr. YOUNG. Yes; it does work out, I am quite sure.

Maybe Mr. Eaton, who is with the Comptroller Office, should explain.

Mr. EATON. The DOD R&D budget for 1985 was \$31 billion; and of that approximately \$16 billion or half of it was extramural—it goes to contractors.

Mr. SISISKY. I was right, wasn't I?

Dr. YOUNG. There are two things that are subtracted from the total RDT&E numbers. One is the operational systems development; the other is what goes to the intelligence agencies, and only the contracts, the extramural portion, is counted.

Mr. SISISKY. So you just really skirted the program just—

Dr. YOUNG. This is in the law—

Mr. SISISKY. I understand.

Dr. YOUNG. This is in the law.

Mr. SISISKY. How do you find dealing in the research and development with the small business community, do you find it a problem in the Department of Defense?

Dr. YOUNG. Working with them; not at all.

Mr. SISISKY. You are very satisfied then?

Dr. YOUNG. Absolutely.

Mr. SISISKY. With the program?

Dr. YOUNG. Yes.

Mr. SISISKY. But you just want to follow the law as it pertains to percentage; is that correct?

Dr. YOUNG. We are the only agency that I know of that is ahead of the budget. All the other agencies are slightly behind. I am not certain of that statement. But I do know this, that we have done better in terms of funding according to the law than any other agency has.

Mr. SISISKY. How much of this is being done in SDI?

Dr. YOUNG. I can give you the topics and proposals received; I don't have the dollar here.

Mr. EATON. \$2.7 billion, maybe.

Mr. SISISKY. \$2.75 billion, I think, that will probably be in 1987.

Dr. YOUNG. I don't know what the 1987 total is, that is up to Congress, not up to us now.

Mr. EATON. I don't know how much of that is done by contractors as opposed to in-house activities, we would have to judge that first.

Dr. YOUNG. If you use the 1986 number and do a quick calculation, if you took 70 or so percent of that for contracts, which re-

duces it to, roughly, \$2 billion. For 1986 now, 1 percent of that, it would come to \$20 million, on that order.

Mr. SISISKY. Let me just ask you some penetrating questions that I have written here, and I would like your honest appraisal of it.

The GAO report published last fall, on the implementation in the SBIR Program, pointed out a disagreement over the Defense Department interpretation of R&D as it pertains to 6.6, of the operational system development funds, the testimony alluded to why these funds are not included in the SBIR Program; could you expand on this a little further?

Dr. YOUNG. Yes; we report the R&D funding under title II, and this includes all of what we refer to as program 6, which is 6.1 through 6.5, as I spelled out. In addition to that we also report under title II what is known as operational systems development, which covers those R&D activities that are going on in systems that are already in production.

If you have a particular problem arising, let's say, it turns out cracks develop in a component, which has been in production for several years, perhaps, and some corrective action has to be taken, that involves an R&D activity on a system already in production.

To go out at that point and advertise to small business and wait at least a couple of years before the problem is fixed, is not a very practical way to solve it. So instead what is done is through the direct relationship between the contractor and the DOD user to address that particular problem; it is simply a practical problem of how to go about solving something, a system, that is in production and needs modification for some reason.

Mr. SISISKY. Of course, reading over the Senate testimony, there was a suggestion that you keep two sets of books in the R&D budget.

Dr. YOUNG. Yes.

Mr. SISISKY. Would you explain how your R&D is defined?

Dr. YOUNG. The DOD budget is organized by mission areas. One mission area is R&D, research and development. This is the one which happens to begin with the digit 6; this is why you hear us say 6.1 and so on. The mission area, R&D, is the one that we apply to the SBIR Program, that is again, 6.1 through 6.5. It so happens that there are also some R&D activities in mission areas other than those defined as R&D.

In other words, if you have a system in production for, say, a command and control system, or a surveillance system, or whatever it is, the system itself is no longer R&D, it is in production. Nevertheless, as you go along in production, a portion of the funds may be used for R&D, and is collectively known as operational systems development, colloquially it is known as 6.6, although no such budget category exists.

When we report on R&D activities, under title II, we report under the totality of R&D activities, those in mission area program 6, as well as those much smaller portions of systems in production where the R&D is done even while production goes on, and that is the problem that we have had. It is hard to explain—

Mr. SISISKY. Let me tell you something; if I ever cracked the code of accounting in the Department of Defense, I would be the biggest hero in the United States.

I am planning to have a press conference tomorrow. I have cracked one code that I am going to announce a finding of almost \$1 billion in errors in the authorization budget. I am working now on the risk-funding accounts.

You know it's strange, I asked the Comptroller General of the United States last week; the Assistant Comptroller General of the Department of Defense and the head of CBO, what is the unused obligated balances. And they said, the accounting system will not allow them to know what it is. I asked, why don't we get a new accounting system?

If we can ever break that code on the current accounting system, I believe we have accomplished a miracle.

Dr. YOUNG. Mr. Chairman—

Mr. SISISKY. I am not criticizing you gentlemen, I am just—

Dr. YOUNG. Mr. Chairman, Mr. Eaton is from the comptrollers office. Maybe I should ask him to give you perhaps, a better explanation than I can give you.

Mr. EATON. I am not going to answer that question in—

Mr. SISISKY. Well, I saved this question to last. Do we have a billion dollars in unused obligated balances, do we have \$5 billion, \$10 billion, \$20 billion, \$30 billion, \$40 billion, \$50 billion? He said, if I answered that question I wouldn't have my job when I get back to the Pentagon. So I can understand why you don't want to touch it either.

What types of projects have been developed under the areas that fall within this category 6?

Dr. YOUNG. I am going to ask Mr. Eaton to answer that.

Mr. EATON. Let me sort of elaborate on what Leo said in just a slightly different way.

The GAO did come to see me; several men came investigating this matter. As you probably know the House Appropriations Committee and Senate Appropriations Committee set the rules by which we put dollar requests into categories, R&D, or production, or O&M, Milpers, or whatever. And several years ago we had any money that we spent on systems that have already gone in production, paid for out of the procurement account, because we have a modification budget in the procurement account that can allow us to go in and fix things to weapons systems that aren't working right or where there has been technological advance by the adversary, potential adversary, and you need to make some changes in your system.

But in their attempt to purify the production account and have it buy nothing but one apple at 10 cents and anything else you do of a nonrecurring nature, be funded in some other account, and they even said, in gray areas R&D will fund the project, where there was some doubt about what you were doing.

We moved all of the modification funds except corrections of deficiencies into the R&D account, so that it was R&D in nature, and engineers and scientists working on the project, that that now pays for all of operational systems work in development.

Mr. SISISKY. Excuse me, that wouldn't come out of your risk funding?

Mr. EATON. I beg your pardon?

Mr. SISISKY. Is there an account called risk funding?

Mr. EATON. No, sir.

Mr. SISISKY. When they do a baseline for a weapons systems do they have an account called risk funding?

Mr. EATON. No; we have a changes type funding, or contingencies, or unplanned problems, that is a natural feature of a design contract.

Mr. SISISKY. But it wouldn't come out of that?

Mr. EATON. No, sir.

Mr. SISISKY. OK.

Mr. EATON. About one-quarter of our budget, our R&D budget for instance, in 1987 it is a \$42 billion request, and about one-quarter of that or about \$10 billion is operational systems development. It is improvements for things already in the force, of a design nature, work that you are doing on that system, even though it has been deployed, in order to give it the increased capability or to fix things that are still wrong with it as you continue to test it.

But if you look at the system and what needs to be done to it, you don't find an opportunity for the small business community to enter into the picture at that time when you are trying to fix something in a system that has already been developed and been fielded. You don't have the luxury of pulling it off the line and bringing in innovative ideas at that point. You must go and fix the systems that are in it, and they very well could have been designed, some of them, by small business. There certainly is a likelihood that some of the subcomponents were built by small business.

But you don't go in there and enter any new companies into the proposal. You deal with those that have supplied the equipment. And the other part of it is that I told the GAO that we have so many superimpositions on our requirements to accomplish national security objectives, overlays, if you will, with other laws that we must also carry out, in addition to the appropriation acts, by line item, that we have to look at how we can continue to satisfy our overall objective and yet take into account all of these other laws that apply, that in some cases conflict, as you may know, with each other. And so in looking at the ground rules we would establish for this program—I was part of a team that did that 3 or 4 years ago—we do consider operational systems development money as research and development in the definition of this law. It is definitely a part of the law and it is not excluded because it is not considered to be R&D; it is R&D. All \$40 billion of the 1987 money is research and development. Having said that, what are you going to apply to the ground rules for this SBIR Act, we then look for legitimate exclusions before arriving at the extramural base, and we excluded this category because it would not be, in fact, available for small business, innovative, new small business. The same as the national intelligence, the funds would not be at our discretion to use for small business.

Having those two exclusions aside we went ahead and followed the rules the rest of the way.

The GAO found that that is correct, we jointly interpreted the act properly, and that we were using the total amount. They simply debated the issue of whether we should exclude or should not exclude part of the R&D dollars. I think their findings did say

they found some cause for what we were doing in line with our overall objectives of national defense.

As I recall their language was somewhat understanding of our position.

Mr. SISISKY. What do you suggest be done to resolve the question of 6.6 money, and whether it should be included in the SBIR Program; do you have any suggestions?

Mr. EATON. Yes, sir; my suggestion, I don't think it was accepted, was that we put a clarifying paragraph in the accompanying report that extends this law. I realize that the report does not have the force of law. But I feel in this case that those that have looked into this matter have not necessarily felt that it was a matter that needed to be handled by a revision to the law, because it would only apply to the Department of Defense, and really wasn't a difference in interpretation or definition, it was just in how we applied the law. So we were hoping that a clarification would provide us with the permission to continue doing what we are doing now, with an understanding of what we are doing and why we are doing it. I wrote such a clarification paragraph, but I think there is some concern as to whether that has the force of law or not.

Mr. SISISKY. Thank you.

Dr. YOUNG. Mr. Chairman, I would like to draw attention to a letter which was sent by the Comptroller General to Chairman Parren Mitchell, on February 21. And his concluding paragraph, which I will read states that:

The Committee on Small Business may wish to consider whether category 6.6 activities should be exempted from the act, because of the practical difficulties cited by the DOD representatives.

I would like to suggest that the committee may indeed wish to consider that, and give us relief by explicitly mentioning it as being exempted.

Mr. SISISKY. We are aware of the letter, that is why I asked you the question so we could get it into the record here as we progress further.

Do you have any comment about 4260 as I asked Mr. Gajewski?

Dr. YOUNG. We feel very strongly that the SBIR Program has been very beneficial and should be extended. The only comment I would have is that I would like to see an exemption added for this particular category which has been referred to as 6.6, otherwise I have no problem with the act.

Mr. SISISKY. Do you have questions, Mr. Conte?

Mr. CONTE. No.

Mr. SISISKY. Thank you very much, gentlemen, we appreciate your being here this morning. We will keep the record open for 5 days, so we may submit you some written questions. We would appreciate an answer. I do thank you.

[The questions and responses follow:]



OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301-3000

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RESEARCH AND
ENGINEERING

Honorable Nicholas Mavroules
Chairman, Subcommittee on General
Oversight and the Economy
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

This is in response to your letter of May 15, 1986, in which you asked for the Department of Defense position on reauthorization of P.L. 97-219, the Small Business Innovation Development Act of 1982. I am pleased to inform you that the DoD supports reauthorization of the statute except for one clarification.

As explained in the DoD testimony, the funds appropriated under Operational Systems Development should be excluded from the Agency's extramural budget used as the baseline for the Defense Small Business Innovation Research Program (SBIR), for example by amending P.L. 97-219, Section 4,(e)(1) as follows:

Definitions. Sec. 4. "(e) For the purpose of this section-

"(1) The term 'extramural budget' means the sum of the total obligation minus amounts obligated for such activities by employees of the agency in or through Government-owned, Government-operated facilities except that for the Department of Defense it shall not include amounts obligated solely for Operational Systems Development, and except that for the Agency for International Development it shall not include amounts obligated solely for general institutional support of international research centers or for grants to foreign countries.

To include the Operational Systems Development funds would be counter-productive to the purpose of the Act. This category of the RDT&E budget was established to address the need either to correct deficiencies in fully developed and fielded weapons systems, or to change the performance characteristics of those systems based on changed requirements. In both cases, the funds go to the specific contractors that developed the baseline system

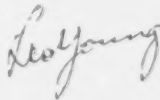
and components and, consequently do not afford new opportunities for the small businesses that are the target of the SBIR program. The result of inclusion of the large Operational Systems Development category, therefore, is to impose a proportionately heavier burden on the other categories to support the program, a result that appears contrary to the Congressional intent evidenced by the statement in Section 4,(f)(1) of P.L. 97-219:

Provided further, that a Federal agency shall not make available for the purpose of meeting the requirements of this subsection an amount of its extramural budget for basic research or research and development which exceeds the percentages specified herein.

These results motivate managers to look for formulations that will give rise to what they perceive to be a more realistic and responsive application of the scarce research budget. Since the inclusion of the Operational Systems Development funds seems to be counter-productive to the purposes of the statute, it would appear that the solution is to amend the Act to include within the "extramural budget" only those research or research and development funds that could in fact be used for possible contracts with small business.

I trust that this explanation is responsive to your inquiry. A letter with a similar explanation was sent earlier to Senators Weicker and Rudman on May 21, 1986. We appreciate your interest in the DoD SBIR program.

Sincerely,



Leo Young
Director, Research and
Laboratory Management

Dr. YOUNG. Thank you.

Mr. SISISKY. The meeting will be recessed until 2:15 p.m., this afternoon.

Thank you very much.

[Whereupon, at 10 a.m. the hearing recessed, to resume at 2:15 p.m., the same day.]

Mr. CONTE [presiding]. The hearing will come to order. Mr. Mavroules will be here shortly. We will begin with Dr. William F. Raub, Director, Office of Extramural Research and Training. Good to have you here, Dr. Raub.

TESTIMONY OF WILLIAM F. RAUB, DIRECTOR, OFFICE OF EXTRAMURAL RESEARCH AND TRAINING, NATIONAL INSTITUTES OF HEALTH, PUBLIC HEALTH SERVICE, DEPARTMENT OF HEALTH AND HUMAN SERVICES, ACCOMPANIED BY LILY O. ENGSTROM, SBIR PROGRAM DIRECTOR, OFFICE OF SPECIAL PROGRAMS AND INITIATIVES, AND RICHARD CLINKSCALES, DIRECTOR, OFFICE OF SMALL AND DISADVANTAGED BUSINESS UTILIZATION

Dr. RAUB. Thank you, Mr. Conte. It is nice to be here.

Mr. CONTE. Never thought I would see you in this room.

Dr. RAUB. A change of venue for both of us.

Mr. CONTE. A change of venue for both of us.

Dr. RAUB. Thank you very much. I appreciate this opportunity to apprise the committee of the status of the Small Business Innovation Research Program [SBIR] of the Department of Health and Human Services and to share with you some observations derived from our experience over the last 3 years. I am accompanied today by Ms. Lily Engstrom, who is the SBIR Program Director for the National Institutes of Health [NIH] and for the larger Public Health Service, and Mr. Richard Clinkscases, representing the Office of the Secretary, DHHS, and responsible for the overall coordination of the Department's small business activities.

The principle operating components that participate in our SBIR Program are the Public Health Service [PHS], the Health Care Financing Administration [HCFA], and the Office of Human Development Services [OHDS]. Of these, the Public Health Service accounts for over 97 percent of the activity.

Within the PHS, the NIH was designated the lead agency, primarily because of its longstanding experience in supporting research and the amount of its extramural research and development budget that would be set aside for SBIR awards. The NIH SBIR set-aside alone constitutes 92 percent of the Department's set-aside. The other participating components of the PHS are the Alcohol, Drug Abuse, and Mental Health Administration [ADAMHA], the Health Resources and Services Administration [HRSA], the Food and Drug Administration [FDA], the Centers for Disease Control [CDC], the National Center for Health Services Research and Health Care Technology Assessment [NCHSR/HCTA], and the Office of Adolescent Pregnancy Programs [OAPP]. As lead agency for the PHS, the NIH works to ensure that SBIR policies and procedures are implemented in a manner that is consistent with both

the enabling legislation and pre-existing agency mission requirements.

Since the inception of the SBIR Program, the PHS, particularly NIH, has arranged for its SBIR coordinators to participate in regional and statewide conferences and workshops throughout the year to inform groups and individuals about the SBIR Program. In addition the NIH, on its own initiative, has carried out a variety of activities to inform the small business research community about SBIR funding opportunities.

From the beginning of the SBIR Program, my colleagues and I have promoted it actively. For example, in February 1983, the Public Health Service sponsored a 2-day SBIR conference at NIH which attracted approximately 450 persons representing over 300 small businesses. At that conference, small business participants were given the opportunity to attend 20 separate technical presentations and to meet with Agency staff for individual discussions.

In October 1984, NIH conducted two regional workshops to provide opportunities for health research oriented small businesses to learn about the PHS SBIR Program in more detail. Topics that were addressed in these workshops included the preparation of grant applications, the NIH process of reviewing applications for scientific and technical merit, and various financial aspects of SBIR proposals and awards.

Last year NIH sponsored and organized a PHS-wide conference in Washington, DC, in which all of the PHS awarding components participated. Program staff of every agency and component were present to meet with small business representatives on a one-on-one basis to provide technical assistance as well as to answer questions. As a result of these efforts by NIH to publicize the SBIR Program and to stimulate increased interest by small businesses, one of the concerns that we had previously—that of an inadequate pool of potential applicants—is no longer a problem.

For the record, to date, approximately 2,180 organizations have submitted SBIR proposals, and a total of 570 have been awarded SBIR grants and/or contracts. In fiscal year 1985 approximately two-thirds of those companies receiving SBIR awards from the Public Health Service were organizations that were new to our SBIR Program.

In implementing the SBIR Program within the Public Health Service, we chose the grant instrument as the primary mechanism of support for two reasons: One philosophical and one practical. First, we wanted an approach that would attract a wide range of research ideas from the small business community as well as from Agency staff; and we are mindful of the PHS experience over the past four decades showing clearly that the grant is unrivaled as a means of fostering the initiative of individual biomedical and behavioral scientists.

Second, as a practical matter, we had to implement the SBIR Program within our traditional budget framework, and it has consistently been the intent of both the appropriation committees as well as the executive branch that NIH use grants to fund the vast majority of research projects, especially those that are initiated and directed by the awardee scientists themselves.

The other components of the HHS share this philosophy. However, due to a provision in their legislative authorities that prohibits awarding of grants to for-profit organizations, HCFA and OHDS selected the cooperative agreement as their mechanism of support for SBIR awards. As defined under Public Law 95-224, the cooperative agreement is an assistance mechanism similar to the grant but which allows for substantial involvement by the awarding agency's staff during the conduct of the research.

In the fiscal year 1985 the PHS SBIR Program introduced the use of contracts as an additional funding instrument. Our reason for doing so was based on the recognition that, in addition to investigator-initiated research, there are specific technical requirements identified by Agency staff that can and should, in accordance with Public Law 95-224, be met through use of the contract instrument. Thus the PHS solicited contract proposals in a number of areas which represented specific research needs of our scientific programs. The two contract solicitations that were issued in fiscal year 1985 drew a response of 379 proposals, 156 of which were funded as phase 1 projects. While grants will remain the primary funding instrument of SBIR awards made by the PHS, contracts play an important role in that they make possible the conduct of research which is primarily for the direct benefit or use of the Government.

Now that we have completed the first 3 years, we are pleased to report that the Department's SBIR Program has been quite successful. In its first year, fiscal year 1983, the Department of Health and Human Services reviewed 779 applications and awarded 139, amounting to \$7.3 million, exceeding our set-aside requirement by \$664,000. Of the total amount, 90 percent or \$6.55 million was accounted for by grants awarded by NIH.

In fiscal year 1984, 921 applications were reviewed of which 226 were selected for phase 1 funding, and 56 for phase 2 awards. These grants totaled over \$23 million, with the lion's share, over \$20 million of the funds, being awarded by NIH. Once again we awarded more SBIR funds than was mandated by Public Law 97-219, this time in the amount of almost \$760,000. Last year the Department reviewed 1,342 SBIR proposals and made 439 phase 1 and 109 phase 2 awards, exceeding our set-aside requirement of over \$43 million by almost \$400,000.

Mr. Chairman, with your permission, I would like to submit for the record, five 1-page abstracts that highlight specific SBIR projects that we think exemplify the purposes of the legislation.

Mr. MAVROULES [presiding]. Without objection, it will be included in the record.

[The abstracts referred to follow:]

Organization:	Integrated Genetics, Inc. 31 New York Avenue Framingham, MA 01701 (617) 375-1336
Principal Investigator:	Katherine W. Klinger, Ph.D.
Product Description:	With support from this grant, Dr. Klinger and associates are developing a diagnostic test to identify carriers of cystic fibrosis.
Potential Pay-Off:	Until now, the identification of the genetic defect that causes cystic fibrosis has been impossible because no biochemical markers associated with the defective gene have been discovered. Ability to detect carriers of the cystic fibrosis gene would facilitate genetic counseling and potentially decrease the number of future victims of cystic fibrosis.
Technical Accomplishments:	Employing elegant molecular genetic techniques, investigators at Integrated Genetics, Inc. have been able to narrow down the cystic fibrosis gene to less than one percent of the human genomic material. This now permits scientists to concentrate on the task of identifying and actually isolating the gene that causes cystic fibrosis.
Basis for Anticipated Success:	Success in this project is anticipated not only because of the encouraging results at Integrated Genetics, Inc., but also because their results have been independently corroborated by other groups.

Organizations:	Candela Corporation 19 Strathmore Road Natick, MA 01760 (617) 653-7373
Principal Investigator:	Horace W. Furumoto, Ph.D.
Product Descriptions:	The product being developed is a tunable dye laser with output characteristics that would make it particularly suitable for the treatment of skin lesions of various sorts and colors. To date, there has been excellent clinical and engineering progress and the company expects to have their product on the market by 1987. At the present time, six units have been manufactured, five of which are in use at the cooperating clinical center, Harvard Medical School. However, the sixth unit has been sold to Northwestern University, thus qualifying as an indication which suggests movements towards pay-off in a marketable device.
Potential Pay-Off:	The major potential pay-off is that while lasers are the vogue in dermatologic therapy, the existing lasers are not ideally suited for treatment of skin lesions but simply represent sophisticated knives. The laser being developed here will allow selective treatment of differently pigmented skin lesions and will not just simply be a fancy knife.
Technical Accomplishments:	The major technical accomplishments have been the design and manufacture of lasers of sufficient power at multiple different wave lengths to allow customization of the unit for the lesion to be treated, both in terms of the absorption of the pigmented lesion and the characteristics of the pulse of light so as to be maximally effective in destroying the lesion while minimally affecting the surrounding normal skin.
Basis for Anticipated Success:	There is reason to expect success because it is becoming readily apparent that the lasers under development are great advances over existing lasers in the treatment of skin lesions. There is also great interest in the dermatologic community, as indicated by the number of individuals who have access to lasers and the number of laser treatment courses being offered, that once such a particularly suitable instrument is available it should rapidly be utilized, at least in teaching centers and very likely in a significant fraction of private practice offices in dermatology in the United States.

Organization:	Technical Research Associates, Inc. 410 Chipeta Way, Suite 222 Salt Lake City, UT 84108 (801) 582-8080
Principal Investigator:	Stephen C. Peterson, Ph.D.
Product Description:	The grantee has developed a blood cell separator based on new ultrasonic techniques involving a method for aggregating and moving particles whose acoustic properties differ from those of the medium in which they are suspended. This method provides a controlled way of separating and moving blood cells from plasma.
Potential Pay-Off:	First, this technology could be an inexpensive alternative to the centrifuge system now used by blood banks or other large blood collecting laboratories. Second, it could be used to extract unwanted chemicals from the plasma fraction of blood (plasmapheresis), cleanse blood for kidney dialysis, or treat diseases such as arthritis. Third, this particle manipulator could be used to economically transport therapeutic drugs for a variety of diseases as the needed mechanism is small, with no moving parts, and drug delivery can be controlled by a microprocessor.
Technical Accomplishments:	First, the particle manipulator is able to separate whole blood on line. Using this technology, whole blood could be separated into components during the donation process and eliminate the need for costly centrifuge systems. Second, methods now used in plasmapheresis and dialysis can be damaging to blood cells; the use of ultrasonic pressure waves decreases such damage. Third, this technology eliminates the need for separation membranes in dialysis and holds blood cells in reserve; thus, treatment delivery is faster and manufacturing costs for disposable elements are cut by 50%. Fourth, the lack of moving parts and microprocessor control gives the product great flexibility for a variety of applications.
Basis for Anticipated Success:	The lead time from laboratory prototype to commercialization is lengthy, primarily due to FDA requirements; thus, it is too soon to evaluate the success of the project. However, this technology can provide solutions to the broad spectrum of problems of which a small sample is described above.

Organization:	Sweet Dreems, Inc. 5465 Blue Cloud Lane Westerville, OH 43081 (614) 431-0935
President:	Armando A. Cuervo
Product Description:	The product under development is a non-invasive mechanical device that generates vibrations and sound for use in a baby's crib. Data generated in clinical studies show that the conditions developed significantly reduce colic in infants.
Potential Pay-Off	Infant colic remains a syndrome of unknown etiology, even though there have been many investigations into its cause and cure. In addition to the obvious discomfort to the infant, it causes considerable stress and anxiety in the family of the affected infant. Thus, colic itself and the family side effects contribute significantly to medical costs during infancy. Additionally, the stressful aspects of colic have been associated, in some cases, with child abuse and neglect. Because this device reduces markedly the crying and agitated state of the colicky infant, it will probably reduce the frequency of doctor visits associated with the syndrome and may also have the effect of reducing the potential for abuse of the colicky infant.
Technical Accomplishments:	The president of this company has successfully developed an idea and single experience into a potentially viable product. His group has designed a prototype, developed a scientifically valid clinical study to evaluate the preliminary design, modified the design, then carried out the definitive clinical study to validate its efficacy.
Basis for Anticipated Success:	The basis for anticipating success of this project is that the product developed appears to reduce colic significantly and meet the needs of the families affected by this syndrome. The president of the company has carefully pursued all necessary steps of product development from patent application through exploring the marketability of the device with major companies involved in the national distribution of children's products. Recently, the device was cleared for marketing by the Food and Drug Administration as the first non-invasive medical device with a medical claim showing effectiveness on babies diagnosed as having colic.

Organizations	Data Sciences, Inc. Minneapolis Technology Center 1313 Fifth Street, S.E., Suite 206 Minneapolis, MN 55414 (612) 623-0373
President and Principal Investigator:	Brian P. Brockway
Product Description:	The product provides for improved automated monitoring of physiological parameters via implantable telemetry, computer-based data acquisition, and on-line data analysis techniques. This research will result in a variety of products for laboratory applications, including telemetry-based systems for monitoring, logging, and analyzing blood pressure, EKG, temperature, gross movement, and other low frequency physiological parameters.
Potential Pay-Off:	The development of this series of devices and their related technologies will permit scientists to collect information from experimental animals in a repetitive way without the necessity of handling the animals. There is high potential in this product because its use by pharmaceutical companies would, for example, permit the testing of anti-hypertensive medication in unanesthetized, unrestrained animals providing more accurate assessments of the pharmacological effects of the medication.
Technical Accomplishments:	The investigator and his company have been able to overcome a number of engineering problems in the design of some of their detecting devices and have improved the marketability of their product. The data acquisition system is progressing nicely but will require the development of a more finely tuned radio receiver to optimize the signal to noise ratio of the system.
Basis for Anticipated Success:	The company appears to be doing well without any external development funds at this time. They are presently able to sell \$10,000-\$20,000 worth of the devices per month with 75% of the sales to academic institutions and 25% of the sales to pharmaceutical companies. The company is optimistic that they will be able to increase their pharmaceutical sales by 50% in the short term. The principal investigator indicates that many of the sales have been to individuals who have attempted to develop similar data acquisition systems but who have been unsuccessful.

Dr. RAUB. Thank you, sir.

Among these are the description of a technique for detecting human carriers of the gene for cystic fibrosis, and another method for a tunable dyelaser that looks quite promising for treating certain kinds of skin lesions.

For the remainder of my statement, I will focus on several administrative issues that are important to the DHHS Program, and I believe to the larger SBIR Program in general. At the SBIR oversight hearings held on March 1, 1984, by the Subcommittee on Innovation and Technology of the Senate Small Business Committee, we had previewed some of the plans that were underway to improve the implementation of our SBIR Program. We are pleased to report that, in accordance with those plans, NIH has established a cadre of health scientist administrators who specialize in managing the SBIR review process. This cadre is fully conversant with the objectives, policies and requirements of the SBIR Program. Its staff members are not only knowledgeable about the array of technical capabilities represented by small R&D firms, but also are familiar with the types of small business organizations that submit SBIR grant applications.

We have also instituted three application receipt dates annually rather than limit the small business community to a single opportunity each year. This approach has been very well received by the small business community. This means that, if a company misses one deadline, it need wait only 4 months, not a year, for the next submission date. There are operational advantages as well. The establishment of three cycles per year spreads the review workload over the full year, and by operating in synchrony with our regular review processes, achieves important economies of scale. One of the features that is part of this three-cycle-per-year approach is that both phase 1 and phase 2 applications are accepted on each receipt date.

Having described our first 3 years' experience with the SBIR Program, we would like to bring the subcommittee up to date on an issue that has been the subject of some interest and speculation—the quality of research funded by the DHHS, and particularly the NIH, SBIR Program.

In fiscal year 1984, the second year of the program, the NIH SBIR set-aside funds more than tripled from the previous year, going from \$6.07 million to \$20.7 million. That year the number of grant applications submitted to NIH did not triple. Consequently, in a few institutes at NIH, specifically the National Cancer Institute, all approved grant applications, regardless of score, were funded. This led to the well-publicized case of a grant application with a score of 499 on a scale of 500 being funded. In our scoring convention, 100 is the highest and 500 is the lowest scientific merit of an application recommended for approval.

Since then, the quality of SBIR applications has improved significantly as the number of applications has continued to grow. The SBIR mean score of 250 compares favorably with the mean score of 227 for NIH regular research grant applications. While the average quality of SBIR grant awards, as reflected strictly by scores, appears to be slightly lower than that of our regular grants, last year some institutes, for example, the National Eye Institute, the Na-

tional Institute of Child Health and Human Development and even the National Cancer Institute, funded SBIR applications with scores essentially equivalent to those funded in their regular research grant program. Thus, we are confident that the quality gap between NIH/SBIR awards and the traditional project grants is proving to be evanescent.

Another matter that we would like to bring to the subcommittee's attention is the question about the eligibility of certain organizations and individuals seeking SBIR funding. While the SBIR policy directive issued by the Small Business Administration does define, in general terms, the eligibility requirements of the SBIR Program, the Public Health Service has found that in several instances, organizations and/or principal investigators that did not and could not meet such requirements were nonetheless submitting SBIR proposals.

In most of these cases, it was the principal investigator who did not appear to meet eligibility requirements because his or her primary employment relationship was with an institution of higher education. In discussions with other Federal agencies, we have determined that this problem is not unique to the Public Health Service although, given the areas of research that are traditionally funded by NIH and the historically strong involvement of universities in biomedical research, this problem may occur with more frequency within our Agency than in others.

In order to minimize, if not eliminate, this problem and to help ensure that the PHS SBIR Program operates in accordance with both congressional and executive branch expectations, our solicitations have been revised to state very explicitly our policy with respect to enforcement of SBIR eligibility requirements. This policy calls for all proposals to be checked for eligibility prior to subjecting them to scientific and technical merit review. Organizations submitting proposals indicating questionable eligibility will be given an opportunity to submit information to verify or substantiate the eligibility of the organization or principal investigator, whichever is in question.

If the principal investigator's eligibility has not been established by a given date, the proposal will be returned without further review. If the organization's eligibility is not verified by the specified deadline, the proposal will be referred to the appropriate Small Business Administration regional office, in accordance with Federal acquisition regulations, for determination of eligibility. We also are double checking awards made prior to the introduction of this stringent screening process. We believe that these steps will go a long way toward minimizing this problem.

Parallel, with our internal efforts to address the issue of eligibility, we also are working closely with other Federal agencies to develop more specific language that could be recommended to the Small Business Administration for inclusion in its policy directive. It is our common belief that more explicit guidelines consistently applied across all participating agencies will, for several reasons, be very helpful.

First, they would make clear the eligibility rules so that interested organizations and principal investigators would have no doubt regarding their own eligibility to participate in the SBIR Program.

Second, more specific uniform guidelines would greatly reduce the number of cases in which one agency makes an SBIR award to an organization that has been or will be denied such an award by another agency on the grounds of ineligibility.

Third, clearer language on eligibility requirements should deter ineligible organizations and principal investigators from submitting proposals. In conclusion, the Department of Health and Human Services is pleased with the implementation and progress of its SBIR Program, and we hope our discussions today are helpful to the committee in its oversight of this important initiative.

Mr. MAVROULES. Thank you very much, Dr. Raub. I ask for your forgiveness for coming in late. I had a meeting with the Speaker.

I want to acknowledge the presence of some of my constituents, and forgive me for not meeting with you at 1:30. I hope to get together with you later for a few moments.

Let me just ask a couple of questions of Dr. Raub. How do you feel about the reauthorization of the SBIR Program?

Dr. RAUB. I understand that some discussions have been underway between staff of this committee and the Office of Management and Budget with respect to the future of the program. We believe that some important momentum has been established for the program within the Department of Health and Human Services and look forward to working with the OMB and the other agencies in defining the executive branch position.

Mr. MAVROULES. Great. You feel the program is very useful and it is working?

Dr. RAUB. Yes, sir; we do.

Mr. MAVROULES. Maybe later on, you could give me a direct answer to that question for the record. I would appreciate that very much.

[The requested information follows:]

While results to date have been very encouraging, there is obviously a need to evaluate the program to determine to what degree it has succeeded in meeting its legislative mandates. Because this information is not yet available and the current authorization does not expire until October 1988, the administration, at this time, has not proposed reauthorization of the Act. However, the prospect of successful commercialization of SBIR-supported research appears to be favorable and inasmuch as it will take several years to capture and quantify the data on the program's outcome, we would not object to an extension of the sunset date of the Act or a reauthorization to permit orderly program operation while data on phase III of the program are being collected and evaluated.

Mr. MAVROULES. Regarding your review process, do you have any small businesses on your peer review boards?

Dr. RAUB. Yes, sir; we make it a point, as a matter of policy, to include individuals from commercial organizations in general and small business in particular in the review groups that are evaluating SBIR applications and proposals. Some of these individuals are working actively in a small business environment, while others may have in the recent past worked in such an environment. Our objective is to obtain a perspective on and insights into the strengths and the limitations of the small business environment for research.

Mr. MAVROULES. Some critics of the SBIR Program have stated that the research conducted by NIH was more in the realm of universities. If you recall, there was a lot of criticism about small busi-

nesses not being especially qualified in this area. Have you found that to be true, or have you found that small business has made a great contribution?

Dr. RAUB. I believe small businesses have made a strong contribution, but it is within the framework of the SBIR legislation which gives a clear emphasis to commercialization and the special capabilities of small businesses in that area. Before the passage of the SBIR legislation, there had been essentially no directive or emphasis on commercialization, and while we indeed funded research that led to commercialization, it was as a byproduct of the larger mission of the Department of Health and Human Services.

In the wake of the SBIR legislation, at all levels in our agency, there has been heightened emphasis and more sensitivity with respect to, among other things, the commercialization of research results. We believe that small businesses have demonstrated their ability to fill that important role.

Mr. MAVROULES. In your judgment, how do the universities feel about the SBIR Program?

Dr. RAUB. I see a marked positive shift in that direction. I believe that initially this committee and others heard a good deal of testimony as to whether funds might be inappropriately diverted that otherwise could flow to universities or that would lead to an imbalanced or incorrect emphasis.

As the program has progressed, we have seen many positive examples ranging from strong collaborations between small businesses and universities to other types of interactions that I think augur well for the future. I believe also that many universities are seeing that contracting with or serving as consultants to small businesses provides another opportunity for their faculty to assist in developing ideas and expressing some of those ideas in ways that would be awkward, if not impossible, within the traditional structure of the university.

Mr. MAVROULES. Good. Mr. DioGuardi.

Mr. DIOGUARDI. Thank you, Mr. Chairman. Thank you for your testimony. Do you think your agency, NIH, would use small businesses for research had we not had the SBIR Program?

Dr. RAUB. Yes; without the SBIR Program there would have continued to be participation of small businesses in our research programs. However, prior to inception of the SBIR Program, that participation was almost exclusively limited to our contract activities, through which we were procuring a product or a service from the small business rather than fostering some of the longer term innovative research and development that is the hallmark of the SBIR Program.

Therefore, while we would have had and would continue to have small business participation, I don't believe we would have either the scope or character of the current participation without the Small Business Innovation Research Program.

Mr. DIOGUARDI. So without the reauthorization you would have to curtail the amount of research being done by small businesses at this time.

Dr. RAUB. I don't know that we would have to curtail it, but I think we would have to take special steps administratively within

our existing authorities to ensure that the kinds and breadth of activities now going on under the SBIR Program would continue.

Mr. DIOGUARDI. Thank you.

Mr. MAVROULES. Thank you very much. We appreciate your testimony here this afternoon.

We are going to take a 5-minute recess before we take the next panel. I do want to say hello to my constituents in the audience. They have been waiting for me now for 2½ hours. I apologize for that.

[Recess.]

Mr. MAVROULES. Mr. George Nesterczuk. Mr. Nesterczuk is the Deputy Administrator, Research and Special Programs Administration, Department of Transportation. He is accompanied by George Kovatch, SBIR Program manager.

TESTIMONY OF GEORGE NESTERCZUK, DEPUTY ADMINISTRATOR, RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION, DEPARTMENT OF TRANSPORTATION [DOT], ACCOMPANIED BY GEORGE KOVATCH, SBIR PROGRAM MANAGER

Mr. NESTERCZUK. Mr. Chairman and members of the subcommittee, it is a pleasure to be here this afternoon to discuss the Department's Small Business Innovation Research Program. The SBIR Program is administered through the Department's Research and Special Programs Administration and was established pursuant to the Small Business Innovation Development Act of 1982 [Public Law 97-219].

In keeping with the spirit of the Program, we are going to keep our testimony short and sweet. First of all, we feel it is still too early to predict with any degree of certainty the outcome of the various SBIR projects we have undertaken because the three phases of the cycle have not, as yet, been completed for any of the projects that we funded.

However, there are presently three contractors in the later stages of phase 2 performance whose projects do hold out some promise for commercialization. We have placed an emphasis on seeking out innovative proposals, and we have encouraged the participation of many small business contractors who would not normally be able to compete successfully for larger DOT research work.

We evaluate the proposals primarily on the basis of technical merit and relevance to DOT requirements and allow the contractors to create a business around their ideas. There is no constraint of operating from pre-existing business structures. We believe that overall coordination of agency programs under the leadership of the Small Business Administration has been good. Our experience indicates the small business community knows about the program and is interested in competing for Government business.

This is also evident in the regional and national conferences we have participated in, where there have been ample and enthusiastic audiences. Our experience with the SBIR Program to date has generally been good. Over the past few years we have had a disagreement with SBA over how our extramural R&D budget should

be established for the purposes of the act, but this issue has been resolved. Other agencies had similar problems.

Many of our technical managers who work with the SBIR Program believe that the program is a simple effective way to reach a broad cross-section of the small business research community that would not usually compete for DOT programs.

The program is administered centrally through our Transportation Systems Center in Cambridge, MA. Administrative expenses are being absorbed by the Department by assessments against operating Administrations in addition to the statutorily required funding for the SBIR Program.

We are now looking forward to the commercialization of some of the projects which we have funded the initial stages. Our statistics on the DOT SBIR Program are set forth in the attachment which we would like to submit for the record.

That completes my prepared statement, and we will be happy to answer any questions you might have.

[Attachment to testimony follows:]

ATTACHMENT

	<u>1984</u>	<u>1985</u>
DOT's Extramural R&D Budget	\$272,400,800	\$308,200,000
DOT's Extramural R&D Budget Set-Aside for Small Business under SBIR	\$1,677,006	\$3,162,339
Number of R&D Solicitations Published for Phase I and Phase II	1	1
Number of Proposals Generated for:		
Phase I	366	318
Phase II	6	16
Actual Number of Awards Made for:		
Phase I	17	30
Phase II	3	6
Funding Level of Awards for:		
Phase I	\$812,785	\$1,481,019
Phase II	\$864,221	\$1,681,320
Funds Expended	\$1,677,006	\$3,162,339
Follow on Funding Commitments for Phase II Proposals	4	7

Mr. MAVROULES. Thank you, and I will also include all the figures in the back as part of the record.

George, do you have any statement that you would like to make?

Mr. KOVATCH. No, sir; I am just here to accompany Mr. Nesterczuk. I do manage the program for the Department, as he has mentioned, out of the Transportation Systems Center in Cambridge. We have full reign to coordinate all the inputs from the various elements and operating Administrations in DOT and it has been working very nicely.

Mr. MAVROULES. I have to ask you this question. How do you feel about the reauthorization of the SBIR Program?

Mr. NESTERCZUK. As we have said, it is difficult to answer all the questions that one might raise. Thus far I don't think there has been enough of a chance to give the program full opportunity to be exercised, so it is probably a good idea at this point to give it some more time so we can do a more complete evaluation.

Mr. MAVROULES. You mentioned on page 3, "We are looking forward to the commercialization of some of the projects for which we have funded the initial stages." Could you articulate on that a little?

Mr. NESTERCZUK. Yes; there are three projects that are in fairly late stages of phase 2 funding that look like they might be commercial successes, and that is basically what we are referring to. We are looking forward to seeing those go out on the street as commercially implementable ideas.

Mr. MAVROULES. Can you give us examples of some of the more favorable projects you have going right now with the SBIR Program.

Mr. NESTERCZUK. Why don't you go ahead.

Mr. KOVATCH. Why don't I run through these three projects. We have only three that are in the second year of their phase 2, so we are using those to describe what we may anticipate in other projects, and we can submit this for the record, of course.

[The information follows:]

DEPARTMENT OF TRANSPORTATION

SBIR PROGRAM

LATE PHASE II CONTRACTORS - PHASE III PROSPECTS

EPSILON LAMBDA
GENEVA, ILLINOIS

A TRAFFIC MONITORING RADAR.
REPLACES NEED FOR CUTTING WIRE
INTO PAVEMENT NEAR INTERSECTIONS FOR
DETECTING PRESENCE OF VEHICLES

BENEFITTING IN TERMS OF
INCOME, STAFF GROWTH,
FACILITIES AND EQUIPMENT
ENHANCEMENTS, AND MARKET
VISIBILITY - MAJOR COMPANY
HAS SHOWN INTEREST

SCHNABEL FOUNDATION CO.
BETHESDA, MARYLAND

EARTH RETAINING WALL COMBINING
TIEDBACK ELEMENTS AND SOIL
NAILING. LESS EXPENSIVE THAN
CANTILEVERED RETAINING WALLS
BUILT IN CUTS

COMPANY CONFIDENT OF A
MARKET FOR PRODUCT AND IS
SHARING IN PHASE II COSTS

AMERASIA TECHNOLOGY, INC.
WESTLAKE VILLAGE, CALIFORNIA

LOW COST DIGITAL ALTITUDE SENSOR
FOR AVIONICS AIR DATA INSTRUMENTATION
USING SURFACE ACOUSTIC WAVE
TECHNOLOGY

TWO FORTUNE 500 COMPANIES
HAVE EXPRESSED AN INTEREST
IN THIS MINORITY FIRM AS A
DIRECT RESULT OF THE
SBIR PROGRAM

DEPARTMENT OF TRANSPORTATION
 SMALL BUSINESS AWARDS
 OVERVIEW OF R & D OBLIGATIONS

	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985</u>
TOTAL R & D OBLIGATIONS			
(1) AMOUNT AWARDED TO SMALL BUSINESS	\$360 M	\$446 M	\$430 M
PERCENTAGE AWARDED TO SMALL BUSINESS	\$ 40 M	\$ 49 M	\$ 57 M
	10.9%	10.97%	13.2%
<u>SBIR</u>			
EXTRAMURAL R & D BUDGET	\$ 98 M	\$272 M	\$308 M
AWARDS	\$.3M	\$ 1.7M	\$ 3.2M
STATUTORY PERCENTAGE	.2%	.6%	1.0%

(1)Excludes SBIR Awards

Mr. KOVATCH. One firm is Epsilon Lambda. It is in Geneva, IL. They are working on a traffic monitoring radar system which would replace the need for cutting up the pavement to install the wire loop detectors in the roadway. So far it is showing very good promise. We see benefits for the company in terms of its income, its growth in staff and facilities, and its input to us regarding the market acceptability which so far is very good. They have had some interest expressed in it by a major company.

The second one is Schnabel Foundation Co. in Bethesda, MD. Their project has to do with an earth retaining wall combining tiedback elements and soil nailing. These are innovative construction techniques. Using these, construction ought to be much less expensive. Where you have the need to excavate a large hole for a construction project, this would tighten up the amount of material that would have to be removed and would obviously have cost-effective results.

The company has indicated confidence that there is a market for this technology, and they, in addition to the funding that we have provided, are sharing in the cost with some of their own funds. We don't require sharing, but in this case the amount of money is more than our limits, and they are participating in that.

The third one I will cite is Amerasia Technology, Inc. They are in Westlake Village, CA. They are working on a low-cost digital altitude sensor for avionics use, particularly air data instrumentation. It uses an innovative technique based on surface acoustic wave technology. To date they have had interest expressed in that technology from two Fortune 500 companies. This happens to also be a minority firm, and I believe it would be fair to say they are into this technology as perhaps a direct result of the SBIR Program.

Mr. MAVROULES. If we didn't have the SBIR Program on a Federal level, would you institute one within your department?

Mr. NESTERCZUK. We do have a small business R&D program that is already fairly active. So I couldn't say that the small business community would be left out. However, the notion behind the SBIR Program of cutting some of the redtape and encouraging small businesses that don't have a track record to go out and get involved, get some funding to support an initial idea—I think is a good one, and so it is helpful. It does encourage some risktaking on the part of Government.

Mr. MAVROULES. I have one final question. Could you elaborate on the dispute you had with the SBA over your extramural budget?

Mr. NESTERCZUK. That occurred in the first year of implementation of the program concerning the definition of what funding was to go into the base against which we would compute the share set-aside. That has been straightened out.

Mr. MAVROULES. That has been resolved.

Mr. NESTERCZUK. Yes; it was resolved in our first year, and we have had no problems since.

Mr. MAVROULES. Silvio.

Mr. CONTE. As you all know, I sit on the Appropriations Committee handling the DOT budget. It is my understanding that all of the SBIR's that have been granted have been through FAA.

Mr. KOVATCH. No, sir; the FAA has approximately two-thirds of the total.

Mr. CONTE. Two-thirds of it.

Mr. KOVATCH. We proportion basically the project that is funded in accordance with the extramural budget for each operating Administration, and it varies, of course, from year to year, but I would say as a rough estimate, the FAA accounts for about 60 percent of the DOT's extramural R&D budget. So their funding in the program is in the same proportion.

Mr. CONTE. Are you comfortable with SBIR?

Mr. KOVATCH. Yes, sir.

Mr. NESTERCZUK. Yes.

Mr. CONTE. In dollars, how many SBIR awards did your Agency make last year?

Mr. NESTERCZUK. Last year it was around \$3.2 million.

Mr. CONTE. How about since it was in effect, what, 3 years now?

Mr. NESTERCZUK. It would be around \$5.2 or \$5.3 million.

Mr. CONTE. And how did that compare with your awards prior to the enactment of the law?

Mr. NESTERCZUK. To small businesses in general? Over the same time period small businesses have received about \$150 million, the same 3-year period.

Mr. CONTE. The same 3-year period.

Mr. NESTERCZUK. That represents approximately 11 percent of our R&D obligations.

Mr. CONTE. Over the past few years that the SBIR Program has been in effect, has the level of research and innovation done by the small businesses met or exceeded your expectation, or has it been less than your expectations?

Mr. NESTERCZUK. I don't know if I could answer that in a broad general statement. The amount of funding to the small businesses has been increasing. If I would take that as an indicator that managers have been pleased with the results, then they have shown that pleasure by providing additional funding to the small business R&D community. But that is my only indicator at this point.

I have not heard of any complaints to the effect that small businesses are not meeting expectations.

Mr. CONTE. Do you have any cost factor involved to your Agency to review all of the applications it receives for SBIR's?

Mr. NESTERCZUK. Yes; there is a small cost involved. It is all concentrated in the Transportation System Center which is where we do the administration.

Mr. KOVATCH. Approximately \$240,000 a year pays for the equivalent of about 2 labor years plus the computers to log in all proposals and the distribution of the solicitation booklet. I give the number of around \$240,000.

Mr. CONTE. If we didn't have the law—assume the law expires and then we don't renew it, how would your Agency set aside a percentage of its funds for R&D budget small businesses?

Mr. NESTERCZUK. Well, basically the same way we do now. As I said, we do spend about 10 or 11 percent of our funds on small business R&D activities. The benefit of the SBIR Program is that it does allow for cutting some redtape, initially in the award process and the review process. We can stimulate some single or one or two

very small businesses—one or two people-type businesses—to venture forth and come out with some ideas to which we would give some credibility in our evaluations. Otherwise the Small Business Program works on the basis of doing an evaluation of financial capabilities and stability of the business, in order to make sure that they are going to follow through.

The SBIR Program allows the Government to take more of a risk in stimulating some innovative activities.

Mr. CONTE. Very good. Thank you, Mr. Chairman.

Mr. MAVROULES. Do you by any chance have any break down of the public versus the private ratio?

Mr. NESTERCZUK. In research?

Mr. MAVROULES. Yes.

Mr. NESTERCZUK. I don't have it handy now.

Mr. MAVROULES. Could you get that for me when you get a chance and give it to us on the record? I would appreciate that very much.

[The information follows:]

DOT SMALL BUSINESS INNOVATION RESEARCH PROGRAM

Based on DOT experience to date with on-going phase 2 projects, the projected private investment is \$4.3M and the Government investment will be \$2.6M. Therefore, our preliminary findings indicate a projection of a private-to-Government investment ratio of approximately 2 to 1.

Mr. MAVROULES. We have been getting some great reports that in some areas every dollar spent by the Federal Government is matched by \$8 from the private sector. Even in the agriculture area, they are talking about 4 or 5 to 1. Those are great margins because the question has arisen over what kind of payback we get when we try to help a small businessperson or an inventor. When you have that kind of a private investment, it is a substantial payback in terms of taxes and jobs and revenues.

Would you agree with that?

Mr. NESTERCZUK. Yes; I would agree in general. It is a question of what type of research or development you are looking at.

Mr. MAVROULES. In your field it would be a lot lower.

Mr. NESTERCZUK. In the SBIR we are concentrating on those proposals that do lend themselves to commercialization, so we are not talking basic technology. So, already we are culling out those things that have a greater likelihood of success in the commercial arena.

Mr. MAVROULES. It would be very helpful if you could get that to us.

Mr. NESTERCZUK. All right, we'll do it.

Mr. MAVROULES. Do you have any other questions?

Mr. CONTE. No other questions.

Mr. MAVROULES. Gentlemen, thank you very much. You have been very helpful. I appreciate your appearance.

[Whereupon, at 3:00 p.m., the subcommittee was adjourned, to reconvene subject to call of the Chair.]

H.R. 4260—REAUTHORIZATION OF THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT

THURSDAY, MAY 15, 1986

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON GENERAL OVERSIGHT
AND THE ECONOMY,
COMMITTEE ON SMALL BUSINESS,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:07 a.m., in room 2359-A, Rayburn House Office Building, Hon. Nicholas Mavroules (chairman of the subcommittee) presiding.

OPENING STATEMENT OF CHAIRMAN MAVROULES

Mr. MAVROULES. The hearing will now come to order.

Almost 4 years ago President Reagan signed the Small Business Innovation Development Act into law. In his Rose Garden speech he noted that,

The Small Business Innovation Development Act recognizes that we in Government must work in partnership with small business to ensure that technologies and processes are readily transferred to commercial applications.

With those words the President pledged his total commitment to the program.

I would also like to point out that when announcing the 1986 Small Business Week, which begins next week, President Reagan stated that the,

Business of America begins with small business * * * their innovative entrepreneurial spirit has brought a new excitement to the marketplace.

This most innovative sector, working together with the participating agencies, has made the SBIR Program a huge success. The testimony of these agencies attests to the high quality of the SBIR proposals. The agency representatives have been very enthusiastic about the program. It has increased small business participation in the R&D process while allowing the agencies to explore new and risky ideas that would never have been considered before.

It is true that we must have patience regarding the marketing of the innovative ideas being developed under SBIR. The agencies, however, have stated that the potential for commercialization of the SBIR projects they have funded is very promising.

Unfortunately, despite these favorable reviews, many agencies have indicated that it may be impossible without this statute to continue an SBIR-like program on their own.

Therefore, it remains up to the Congress to ensure that our Federal agencies continue this cooperative arrangement with small

high technology firms. If we want the SBIR Program to continue, there is no reason then not to reauthorize it now.

I would like to submit for the record a letter I recently received from the National Federation of Independent Businesses. The membership of NFIB has long been among the most vocal supporters of the SBIR Program. They note in their letter that,

The successes of this program are many, and the biggest winner proves to be the Federal Government.

NFIB also states that,

The excellent job being done by the Small Business Administration in managing the SBIR is the primary reason the program can boast so many successes.

Furthermore, they have expressed enthusiastic support for our efforts to reauthorize the Small Business Innovation Development Act, pointing out that,

While the act does not expire until 1988, Government agencies must begin their budgeting efforts now for the upcoming years. It is appropriate that you begin the process of permanently reauthorizing the SBIR.

[The letter referred to follows:]



May 14, 1986

Hon. Nick Mavroules, Chairman
Oversight Subcommittee
House Small Business Committee
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I am writing you today to commend you for your timely oversight hearings on the Small Business Innovation and Development Act and to advise you of NFIB's unqualified support for this program.

As one of the Congressional leaders in the battle to enact the SBIR, you remember well the role that NFIB played in that effort. In 1981 when we began the debate on this proposal, none of us realized the size of our opposition. It is rare indeed for a bill of any type to involve Congressional consideration by seven committees. Our adversaries included big business, federally funded laboratories, universities, and even some government agencies. Again and again we ran into the inherent unwillingness of individuals and entities to acknowledge the contribution small business was making to innovation in this country. Again and again we responded with the facts and outlined the merits of our position. One by one our adversaries were convinced that small firms could do the job without jeopardizing the quality or quantity of the research and that the government served to benefit from small business participation.

Looking back on the repeated successes of this program throughout the government, I think we can all agree that our hard fought efforts were justified. Currently twelve government agencies with extramural research and development budgets of over \$100 million have established SBIR programs by setting aside 1.25 percent of that money for small businesses. Another seven agencies with R&D budgets in excess of \$20 million have established similar small business goals for such funding. It is even encouraging to note that over thirty states have developed similar or complementary

programs. Indeed, these hearings have reinforced what we already knew: the program works and the participating government agencies want to see it continued. There is an expressed need for this formalized mechanism to maintain the cooperative effort between government agencies and small business.

The successes of this program are many, and the biggest winner has proved to be the federal government. Our government has direct access to the most innovative sector of the country's economy. Because the pool of available scientific and technological expertise continues to increase, the government is able to upgrade its own technological process. The program has also had a direct positive impact on maintaining the United States' preeminent position in technology development. In addition, conversion of research into new products and services has increased due to the SBIR with the both the marketplace and the government benefitting.

NFIB thinks one of the reasons why this particular program is such a winner is that every item in a solicitation is in keeping with an agency's own programmatic goals. It is not a federal assistance award program. The awards of funds under the SBIR are made on a competitive basis. It is encouraging to note that abuses associated with other set aside programs have been successfully avoided in the SBIR.

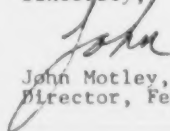
There is no doubt in our mind that the excellent job being done by the Small Business Administration in managing the SBIR is the primary reason the program can boast of so many successes. Richard Shane, Assistant Administrator for Innovation, Research and Technology at SBA, is to be commended for his work in coordinating the efforts of all the participating government agencies. The government's contracting officers agree that the technical quality of the proposals they are receiving under the SBIR is significantly improved because of SBA's efforts. In addition, SBA's staff should be credited for making this program workable for interested small businesses.

Probably one of the biggest benefits of this program has to do with the special contribution small business has been making to our economy over the last decade. It has been noted frequently that the majority of all new jobs during this period have been generated by small firms, especially for firms in the R&D field. There has been a doubling of employees in most businesses involved in the SBIR program. Again, the nation's economy benefits: revenue-generating businesses are expanding and taxpaying employees are increasing.

NFIB feels strongly that continuity of the Small Business Innovation Development Act is essential. At a time when deficit reduction is on everyone's mind, it would prove irresponsible to cut back, in any way, a program that has proved itself to be so efficient and cost effective. As a result of the \$1.08 million SBA spends on the SBIR, small business receives \$480 million in Federal R&D awards. While this Act does not expire until 1988, government agencies must begin their budgeting efforts now for the upcoming years. It is appropriate that you begin the process of permanently reauthorizing the SBIR. We would hope that in future hearings you would look at increasing the size of the set aside and other improvements that can be structured to make this program even better.

The SBIR is no longer an experiment. It should be permanently reauthorized, and NFIB endorses your legislation to accomplish this goal now.

Sincerely,


John Motley, III
Director, Federal Legislation

Mr. MAVROULES. I think we will all agree that the SBIR is no longer an experiment. With those words, I would now like to turn to my colleague and friend, Mr. Conte, for any opening statement.

OPENING STATEMENT OF HON. SILVIO O. CONTE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MASSACHUSETTS

Mr. CONTE. Well, there isn't much I can add, Mr. Chairman. I am one of the original sponsors of the SBIR and have held many hearings, I believe 4 years ago. And I was at that White House signing.

I am really pleased, and I am pleased that you have called these hearings to get this feedback that we have been getting from the agencies. It has been really very encouraging. And I think we are building up a good solid base here and a case that will help us in drafting a reauthorization bill.

Thank you.

Mr. MAVROULES. Thank you very much, Sil. Our first witness, Mr. Roger S. Cortesi, is Director, Office of Exploratory Research for the Office of Research and Development, accompanied by Mr. Walter H. Preston, SBIR Program manager, and Mr. Donald F. Carey, science advisor to the SBIR Programs. Mr. Cortesi, if you would proceed with your testimony.

TESTIMONY OF ROGER S. CORTESI, DIRECTOR, OFFICE OF EXPLORATORY RESEARCH, OFFICE OF RESEARCH AND DEVELOPMENT, U.S. ENVIRONMENTAL PROTECTION AGENCY [EPA], ACCOMPANIED BY WALTER H. PRESTON, SBIR PROGRAM MANAGER, AND DONALD F. CAREY, SCIENCE ADVISOR, SBIR PROGRAM

Mr. CORTESI. Good morning. It is a pleasure to appear before you this morning to discuss EPA's SBIR Program. In general, we believe that this program has been a success and we have experienced no major problems implementing the requirements of the Small Business Development Act of 1982.

Our SBIR Program funds are awarded in two general research areas. One, engineering projects to control or lessen pollution. And two, instrumentation of use to EPA in pollution measurement and monitoring.

The EPA SBIR Program consists of three phases. Phase I establishes the technical merit and feasibility of proposed research for R&D efforts that may ultimately lead to commercial products or services, while determining the quality of performance of the small business awardee organization. Awards normally may not exceed \$50,000 for a 6-month period.

Phase II continues the research or R&D effort for the most promising projects initiated in phase I. Funding is based on the results of phase I and the scientific and technical merit of the phase II proposals. Only phase I awardees may receive a phase II contract for up to \$500,000 by SBA policy directive, for a period not to exceed 2 years. In practice, we, at EPA, have set an upper limit of \$150,000.

Phase III. Small businesses are then to pursue, with private capital, the commercialization of the results of R&D funded in phase I and phase II.

The funding history of our program to date is as follows: In our initial year, which was fiscal year 1983, we received 214 proposals from small businesses located in 37 States and the District of Columbia. They were allocated \$248,000 and we funded 10 phase I proposals. That would roughly be \$25,000 each.

The second year, fiscal year 1984, we received 136 proposals from small businesses located in 31 States and the U.S. Virgin Islands. With our budget of \$852,000, we funded 10 more phase I proposals and 5 phase II proposals from among our phase I winners of fiscal year 1983. Phase I proposals averaged \$35,000 per and the phase II proposals averaged \$100,000 each.

Our budget for fiscal year 1985 was \$1,900,000. We received 154 proposals from small businesses located in 36 States and funded 20 phase I proposals and 6 phase II proposals from the 10 fiscal year 1984 phase I winners. The phase I proposals were then up to an average of \$50,000 each, and the phase II at \$150,000 each.

This fiscal year our budget is \$2,700,000. We are now evaluating the 199 phase I proposals we received with the intent to make approximately 25 awards, and in addition, 8 to 10 phase II awards from the 20 phase I winners of fiscal year 1985.

The first phase II winners have finished their work. And while it is too early to demonstrate commercial utility, all of these initial phase II winners have shown a measurable degree of success in attaining that goal.

For example, Bend Research, Inc., of Bend, OR, has successfully obtained private funding for the commercialization of a unique cost-effective process to recover metals from electroplating and electronics industries hazardous waste sludges. Bend Research, Inc. has combined their new coupled transport membrane separation process with existing, established recovery techniques to convert some of the constituents of plating sludges into reusable or saleable metal compounds, while at the same time reducing the volume of waste as well as making that waste nonhazardous.

Don, would you show them that? We brought a few samples. This is a piece of copper.

The metals and electronics industries generate over 7 million tons of hazardous waste sludges yearly at a disposal cost of \$100 to \$400 a ton.

These sludges contain substantial amounts of hazardous heavy metals which present a serious disposal problem and represent a waste of natural resources. The intrinsic value of metals such as nickel, chromium, and tantalum contained in these sludges is high, providing a significant incentive for their recovery.

Even nonhazardous metals, such as iron and zinc, are separated. However, such typically minor constituents have little value and may be discarded following EPA guidelines for hazardous waste. The Bend process can potentially eliminate the high hazardous waste sludge disposal costs of \$0.7 to \$2.8 billion per year for the electroplating and electronics industries, while reducing raw material requirements by enabling recycle and/or resale of the metals involved.

Preliminary studies using actual plating waste sludges show promising process economics, with an estimated return on investment in capital equipment of 27 percent per year based on the value of the metals recovered and the decreased sludge disposal costs.

I might add parenthetically that the plating industry is typically small businesses themselves. So here we are not only funding small businesses but giving a product which would be of use to other small businesses around the country.

Concept Membrane Manufacturing Co. has recently licensed the bend research process and is negotiating joint funding agreements with other interested companies to construct commercial units.

The second example which is the Chemical Process Corp. of Brookfield, WI, is developing a process to use cheese whey to make a formaldehyde-free thermosetting resin, which can be used to make chipboard and plywood. The use of cheese whey to make the new resin could relieve a significant load on waste treatment facilities since 1 billion pounds of waste solids are produced every year. Less obvious advantages are the use of renewable resources—whey—instead of nonrenewable petroleum-based formaldehyde.

Chemical Process Corp. is presently holding discussions with resin producers and raw material sources for the construction of a pilot-scale plant and ultimate licensing of the process.

The third example is Richard Jablin and Associates, Durham, NC, has developed a slag steam generator to eliminate the air pollution resulting from the present practice of cooling molten slag for metallurgical operations by pouring it on the ground. The process recovers the energy of the molten slag in the form of high pressure steam. It quickly cools the slag in a closed, controlled atmosphere which essentially eliminates the discharge of emissions to the air.

In the course of the project it was discovered that the product from the process is superior to the present slag product. It is more easily handled than normal slag and results in a more valuable product. This product should, therefore, bring a higher price than the old slag product. The energy saving potential is equivalent to 400,000 gallons of oil annually in the United States.

Engineering studies and preliminary estimates of capital and operating costs have been prepared for a blast furnace in each of five steel companies. In every case the study shows payback on the investment of this process to be less than 1 year. This results from savings in energy, higher value products, reduction in material handling and lower pollution emissions.

Present depressed steel industry conditions in the United States have inhibited commercial use of this new process as well as other capital improvements. It is expected, however, that this process will be adopted when conditions improve.

My final example, PEI Associates, Inc., of Cincinnati, OH, has discovered an onsite recycling approach to eliminate the problem of the disposal of hazardous electric arc furnace dust. Dust emitted from arc furnaces at steel mills is normally captured by large bag-houses and sent to controlled hazardous waste landfills. Prior attempts to recover the useful metals in the dust by recycling it in the furnaces have not been successful due to the powdery nature of the dust.

PEI has used an inexpensive pelletizer system to agglomerate the dust into pea-sized pellets. This is called greenballing for reasons that are not obvious to me. But anyway, it is strong enough to enable them to withstand the rigors of transport, charging, and operation of the furnace without reverting to dust. An experimental dust greenballing/recycling program at an actual steel mill using electric arc furnaces has shown the process to be cost-effective.

The major advantage of onsite greenballing/recycling process is the elimination of the need to transport the dust to expensive controlled hazardous waste disposal facilities, charging upward of \$150 a ton. Other advantages are its simplicity, low capital cost, relative insensitivity to electric arc furnace dust composition, and applicability to both minimills and large mills.

The development of this cost effective approach is of great value in minimizing the use of hazardous waste landfills while conserving expensive minerals and reducing emissions to the environment. Here again, the adoption by steel mills awaits a more favorable steel business outlook.

EPA, a regulatory agency, is dependent on the state-of-the-art pollution control for implementation of its regulatory programs. The above examples of successes under our SBIR Program appear to offer the potential for more cost effective pollution control technology.

Given the relatively short existence of the SBIR Program, we are only beginning to see the results. However, indications are that SBIR contributions could result in lower pollution emissions to the environment. Thank you, Mr. Chairman. That concludes my prepared remarks.

Mr. MAVROULES. Thank you very much, Mr. Cortesi. We appreciate it. You certainly gave us some very vivid examples. Sil, do you have to go to another meeting? I would refer to you at this point if you like.

Mr. CONTE. Just a couple of questions. Mr. Cortesi, one of the major concerns I have had over the years now is the control of acid rain. And I think there is general agreement that acid rain is caused by emissions from industries.

Do you have any SBIR's working on that?

Mr. CORTESI. I do not recall any offhand, Mr. Conte.

Mr. CONTE. That might be a good area to get into.

Mr. CORTESI. It is in our solicitations that that is one of the areas that we are concerned about. And we are, as you know, at the mercy of what the solicitation generates.

Mr. CONTE. That's right. How about water contamination? Do you have any SBIR Programs in the guise of water contamination, wells and stuff like that?

Mr. CORTESI. Wells, yes; we do.

Mr. CONTE. Tell us about it. That is a big problem up in Massachusetts.

Mr. CAREY. We have one unique approach, where wells are frequently plugged by organic growing organisms.

Mr. CONTE. Right.

Mr. CAREY. We have one where there is a radioactive source triple contained down in the well to kill those organisms. Research is ongoing. It looks very promising.

Mr. CONTE. That is good. Overall, are you satisfied with the SBIR Program? Does it need any improvements, any changes? If we did not have this on the books, this SBIR Program as a matter of law, would you be carrying out in the same fashion that you are carrying out now for small businesses?

Mr. CORTESI. We would not and we could not. We would be forbidden by the procurement regulations from setting up an EPA SBIR Program.

Mr. CONTE. You did not answer the rest of the question.

Mr. CORTESI. We find the program easy to run and we are really very pleased with the quality of the proposals and the work that we have gotten. Yes; we are happy.

Mr. CONTE. Well, these three examples that we have here at the desk, certainly just the three of them are worthy of continuing the program. Taking that slush and making copper out of it, that is amazing. Getting rid of all that darn toxic waste at the same time. You are coming up with something that is worthwhile then. Thank you, Mr. Chairman.

Mr. MAVROULES. Thank you very much, Sil. Mr. Cortesi, you are stating in fact that you find it to be a very worthwhile program. Am I correct? I am not trying to put words in your mouth.

Mr. CORTESI. We have found it to be very successful. And we are pleased with the quality of the results that we have gotten, and we would not oppose a reauthorization or a pushing out of the sunset date.

Mr. MAVROULES. Would you endorse a reauthorization?

Mr. CORTESI. I am only going to say we would not oppose it right now. And we think it ought to—we would not oppose continuing to see how well it goes.

Mr. CONTE. Would you yield, Mr. Chairman?

Mr. MAVROULES. I would yield.

Mr. CONTE. You are being very cautious. You have not gotten the word from OMB yet? Is that the idea?

Mr. CORTESI. You heard the word from OMB that we got.

Mr. MAVROULES. I think you did very well with what you had to say. We appreciate it very much.

Let me talk about a payback system. There has been a question that has come up here before the committee by one or two Members, stating that we should have a payback formula. In other words, if I invest so many dollars then you should give back to me, the Government, so many dollars.

But we can't forget the other side of the coin on that, whereby people have testified that the public/private ratio on investment runs as high as eight to one, seven to one, six to one, and in some cases four to one, which in my judgment certainly is a great payback in itself. And you, when you come up with a new technology, are certainly being very helpful. You are creating new jobs. You are collecting moneys on the revenue for taxes.

What do you feel would be a public/private ratio on investment in some of the things that you are handling right now? Are you prepared to tell us now, or are we too early?

Mr. CORTESI. I don't have the slightest idea, to be quite honest with you. We have not run those numbers through but we will certainly make a note of your interest and take a look at it.

Mr. MAVROULES. Could you do that for us, run it through?

Mr. CORTESI. It is an interesting thought.

Mr. MAVROULES. Is it safe to say though that the private investment is far greater than the public investment? At this point?

Mr. CORTESI. I honestly just haven't even thought of that. I just could not even make an educated guess.

Mr. MAVROULES. Before you come back with your information let me inform you that I believe that is the case. All you have to do is tell me what the ratio is. OK?

Mr. CORTESI. OK.

[The response follows:]

EPA's SBIR Program just now has projects going into phase III, and hence we currently have no data from which to calculate the private-public investment ratio.

Mr. MAVROULES. Would the EPA utilize small business to perform research and development tasks to the same extent without the SBIR Program?

Mr. CORTESI. No; that is not to say that some of these projects would not have been funded. But for the greater part, they would not have.

Mr. MAVROULES. OK. To what extent is follow-on funding a factor in your selection process?

Mr. CORTESI. It comes into our selection process in the basis of whether we think the applicant is seriously considering the problem of follow-on funding and going after it. And our assessment is of how successful that is apt to be.

So it is a factor, in that sense, that we would like to see that people are thinking about that and taking it into account. Because if you cannot move into a phase III, a phase I or II is not very useful.

Mr. MAVROULES. I am delighted with the testimony on your water projects. Is there a possibility of getting into the acid rain problem with an SBIR Program?

Mr. CORTESI. It depends entirely on whether we get proposals in. As I say, we ask for proposals in that area, and if we get good proposals in there, we will fund them. It is a competitive process and

the original phase I proposals are looked at by researchers in our laboratories. That is how the review of those is done.

And phase II is done by a panel we have for use in our Competitive Grants Program, of engineers, which select from the phase I. And we think we are getting very high quality reviews and intelligent ones. We are pleased with that part of the process too.

Mr. CONTE. Did not Dr. Lonsdale of Bend Research testify here last year that he felt he had some technology that could control acid rain?

Mr. CORTESI. I don't know.

Mr. CONTE. When you go back to your shop you should look to see if he has applied to the SBIR Program. I think he did.

Mr. MAVROULES. I think you are right, Sil. I think he mentioned something about doing that. That might be a good one for you to check out. He came here last year with great testimony.

[Mr. Cortesi's response follows:]

The person who testified was Dr. Lonsdale of Bend Research. Bend Research has not submitted to EPA's SBIR Program an acid rain proposal.

Mr. MAVROULES. We appreciate your presence and your testimony has been delightful. Thank you.

Mr. CORTESI. We were flattered to be here.

Mr. MAVROULES. Thank you. Mr. Norman J. Latker, Director, Office of Federal Technology Management Policy Division, OPTI, accompanied by Mr. Edward Tiernan, chief, Office of Research and Technology Applications, NOAA. Good morning, gentlemen, and welcome. And Mr. Latker, if you would proceed, we would appreciate that.

TESTIMONY OF NORMAN J. LATKER, DIRECTOR, FEDERAL TECHNOLOGY MANAGEMENT POLICY DIVISION, OPTI, U.S. DEPARTMENT OF COMMERCE, ACCOMPANIED BY EDWARD TIERNAN, CHIEF, OFFICE OF RESEARCH AND TECHNOLOGY APPLICATIONS, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION [NOAA]

Mr. LATKER. I think we would appreciate the testimony that we provided to you to be placed in the record rather than going over it. I think that I can just synopsise it in just a few moments.

Mr. MAVROULES. Certainly, without objection, your total statement will be included in the record.

Mr. LATKER. I think that you can see from the testimony that the Department is very supportive of the SBIR Program. Right now, Census, NBS, and NOAA are participating in the program on the basis of the \$100 million trigger occurring in 1984.

Our support for the program is based on the belief that it will deliver tangible results out of proportion to the amount of funding that is involved. We think this is going to occur because of the structure of the program that Congress has created.

And, first, and obviously, there is a possibility of funding high-risk ideas coming from the private sector, their own ideas generated by them, not by the Government.

Second, and very important, is the simplified process of reviewing the proposals and also the after-the-fact review involved, which is something of an incentive to entice people into the program.

And last, and important from our perspective, is that the proposer's ownership of ideas going into the program and going out of the program are guaranteed to the proposer. And those ideas are what he is basically bartering off, given that the program shows that they have value to the private sector to continue the innovation process on the way to commercialization.

And, of course, commercialization of new ideas in the United States at this time, given the trade deficit, should be of paramount importance to everyone. Also, the structure of the program permits the proposer to plan how he will continue to pursue his ideas, even at the time that he is seeking the award. Knowing that he will own the ideas coming out of the program, he is able to look down the road and determine how he will continue pursuing his ideas after the Federal involvement is over.

I think that basically synthesizes the testimony that we have submitted.

[Mr. Latker's prepared statement follows:]

PREPARED STATEMENT OF NORMAN J. LATKER,
DIRECTOR, FEDERAL TECHNOLOGY MANAGEMENT
POLICY DIVISION, OPTI

Mr. Chairman and Members of the Subcommittee

The Department of Commerce was pleased to receive your invitation to appear before this Subcommittee to discuss the Small Business Innovation Research (SBIR) program. I am accompanied by Mr. Edward Tiernan, Chief, Office of Research and Technology Applications, National Oceanic and Atmospheric Administration (NOAA), who is assigned to manage the SBIR program in the Department.

In 1842, after five-years of pursuing Congress, Samuel B. Morse was granted \$30,000 to test the feasibility of bringing his concepts on telegraphy into practical application. The grant allowed Mr. Morse to build a test telegraph line between Baltimore and Washington. No conditions or unnecessary regulatory control were imposed that would impede commercial application of the results. This telegraph served as the prototype and incentive for the investment of capital to construct a nationwide network of lines under patent licenses from the inventor.

Notwithstanding the demonstrated opportunities to the Nation created by the grant to Mr. Morse, the government did not create a program to provide similar grants of seed capital until the enactment of the SBIR program in 1982.

As you know, the primary purpose of the SBIR program is to set aside a small portion of the research and development funds appropriated to Federal agencies to the funding of high-risk technology developed by small businesses which is potentially useful both in the commercial marketplace and the funding agency. The execution and impact of this program is of great importance to Commerce not only as an agency R&D sponsor but in our broader role of creating incentives and removing barriers to swift introduction of new U. S. products and processes into the commercial marketplace.

There is a growing understanding that the commercial marketplace is now global and the health of the United States economy can no longer be addressed in isolation. In this context one foreign competitor after another has learned that control of a new technology results in control of the marketplace even beyond the parameters of the technology. Foreign competitors have already become the primary suppliers of new technologies which have displaced older technologies previously supplied by the United States.

Notwithstanding losses of these markets and jobs we are not standing still. While small businesses are languishing in many parts of the world--where high technology small businesses are virtually unknown--the United States is experiencing a small

business explosion. We are creating hundreds of thousands of new small businesses a year. About 10% of these are high technology companies which then create 5-15 support jobs in other companies. Economic value from such support functions constitute approximately 50% of our GNP where they serve as a stabilizing flywheel. SBIR is an important part of this equation because these start-up high technology companies are most vulnerable when their discoveries are still being developed and risk capital is hard to find.

There is an urgent need to maintain and enhance this progressive climate for innovation in order to cope with the massive global changes in process. President Reagan recognized this when he signed the SBIR program into law. He said:

"Small business is a tonic for what ails this country. By passing and signing this act, we're showing our resolve to unleash this most innovative sector. The Small Business Innovation Development Act recognizes that we in government must work in partnership with small business to ensure that technologies and processes are readily transferred to commercial applications."

It is important to keep in mind why the SBIR program continues to command wide spread support:

First, outside of the government's basic research programs, most R&D programs cannot easily address and support a private sector technology solution to an agency problem unless it had been specifically budgeted,

Second, the program has successfully developed as required by Congress a "simplified standardized funding process" in response to the inability of small innovators and entrepreneurs to work within burdensome and inconsistent regulatory theories and,

Last, Congress required that agencies permit the awardee to retain ownership of the ideas proposed to the agency. It is the patentable, copyrightable or technical data results that awardees own and license to third party developers and investors that act as the incentive to further private sector funding and commercialization.

Outside the template created by Congress for the SBIR program, these principles cannot be reproduced without further legislative and regulatory reform. In fact the principles of the SBIR program have become the model that other programs are attempting to emulate. For instance:

- 1) In February 1983, President Reagan directed all Federal agencies, to the extent permitted by law, to apply the same patent policies applied to the SBIR program to all other contractors not so treated; and
- 2) A number of state governments have initiated their own SBIR programs. Some states encourage applicants to apply for Federal SBIR awards in conjunction with local programs thereby enhancing the prospects of successful commercial applications in the local economy.

I would like to conclude by giving a brief oversight of our management of the SBIR program within the Department.

Commerce conducts its program through a working group consisting of one member from each agency contributing to SBIR program funding. The working group selects topics for the solicitation, arranges for the review and evaluation of proposals, and selects the winning proposals. Each Phase I proposal receives at least two independent reviews by DOC scientists and engineers and Phase II proposals at least three, one of which must be by an external reviewer. Selection is based upon scientific and technical merit, relative importance to DOC, program balance, and commercial potential. These procedures are working well and producing results that have the potential of meeting our research needs and the objectives of the SBIR program. In this regard, the convergence of agency research needs and program objectives, the subcommittee may be interested in knowing that the ranking of our Phase II proposals, based upon scientific and technical merit and DOC need, exactly matched the level of third party funding commitments that were received after the rankings were made. The highest ranked proposals received the highest level of third party funding commitments. This fact made the selection quite straight forward.

The Department's program was initiated in 1984, when, for the first time, the extramural R&D budget exceeded the \$100,000,000 threshold for participation. Our extramural R&D budget for FY 84 was \$103,907,000 and at the 0.2% level for the first year the reallocation was \$208,000; our SBIR program, in

terms of funding is small -- very small when compared to other departments. However, our research programs cover a broad spectrum of disciplines in the environmental sciences in the National Oceanic and Atmospheric Administration, physical measurement sciences in the National Bureau of Standards, and statistical methods in the Bureau of the Census. To provide an opportunity for a correspondingly broad spectrum of small business research capability we set the maximum funding limits at a relatively low \$30,000 for Phase I and \$200,000 for Phase II.

The first Department of Commerce SBIR program solicitation was released on October 15, 1984. Over 3,000 copies were provided to small businesses. That solicitation included research topics of interest to NOAA in the atmospheric and hydrological sciences, ocean science and engineering, living marine resources, space and surface based remote sensing, and applications of environmental data. In response, we received 154 proposals and seven awards were made totaling \$204,000. At least one proposal in each of the research topics mentioned received an award and all seven submitted Phase II proposals. Three Phase II proposals were selected with follow-on funding commitments totaling over \$1,000,000.

The second Department of Commerce SBIR program solicitation was released on October 15, 1985; this time including research topics of interest to the National Bureau of Standards and the Bureau of the Census as well as NOAA. In response, 184 Phase I proposals were submitted and 10 were awarded contracts.

Mr. Chairman, the Department's program is two years old and we only recently made our first Phase II awards. Therefore, assessment of the program, based on the quality of research done and its impact on our research programs would be premature. However, if we were to assess the program based upon the quality of proposals we have received and the feasibility studies completed in Phase I, it is quite clear that the SBIR program has the potential of making a significant contribution to our R&D efforts. Further, third party interest in the technologies that may emerge from Phase II, as expressed in follow-on funding commitments, suggest that these technologies would indeed have commercial value.

Finally, we have had no significant problems in implementing the program. Public Law 97-219 is clear with clearly stated objectives and requirements. The policy guidance and program coordination provided by the Small Business Administration has been equally clear and helpful.

We thank you for the opportunity to provide testimony in the Department's program and hope it will be helpful in the subcommittee.

Mr. MAVROULES. Well, thank you very much. Would you be supportive of the reauthorization of the SBIR Program?

Mr. LATKER. I think that we can say yes to that, yes.

Mr. MAVROULES. Thank you. We appreciate that very much. In what topical areas are you finding good results? Could you highlight some of your favorite programs for us?

Mr. LATKER. I think that Ed is much more knowledgeable than myself on that.

Mr. MAVROULES. Could you give us a couple of examples?

Mr. TIERNAN. I have one that might be of interest to you in that it is research in the long-term holding and culture of American lobsters.

Mr. MAVROULES. Well, it certainly is. If we want good lobsters we had better take care of them. We will give them to you from New England.

Mr. TIERNAN. Yes; they are often referred to as New England lobsters or Maine lobsters. Today, I would like to call them Massachusetts lobsters.

Mr. MAVROULES. I'll buy that.

Mr. TIERNAN. The Department of Commerce has a phase II contract with a company in San Diego, CA, that is experimenting with

long-term holding of lobsters by inhibiting the molt of lobsters. High-density holding of these lobsters, so that the market price will be stabilized over the year. It seems like there is considerable loss in lobsters that are held in tidal ponds to disease and cannibalism when they molt.

One aspect of the research is to develop techniques for inhibiting the molting process by holding lobsters in lower than normal water temperatures.

The more interesting aspect of the research is the possibility of accelerating the molting process by holding the lobsters in warmer than normal water. By increasing the water temperature, the molting process is stimulated and a submarket size lobster may grow 15 percent in length and possibly up to 50 percent in weight between molts.

If they are successful they may be able to take submarket-size lobsters that are caught in the wild and accelerate their growth, thereby increasing the product of the annual catch. The payback of the research to the Department of Commerce is through NCAA and the National Marine Fisheries Service, which has responsibilities for the conservation of our marine fisheries resources. Certainly if this experiment is a success it will contribute to a more efficient utilization of the very valuable lobster fishery.

Mr. MAVROULES. That is very interesting. Do you have another example maybe?

Mr. TIERNAN. Yes; one that can be related to the problem of our international balance of payments. Since 1963, direct readout of satellite data has been possible with what was then fairly low resolution data—resolution on the order of 4 kilometers.

Ground equipment for direct readout stations—by direct readout I mean readout only when a satellite passes through the cone of reception of a ground station—in those days cost about \$200. So they proliferated; many are in use around the world. However, today's satellites transmit data that can provide resolution to one-half a kilometer.

The data transmission rates are, of course, much higher and the cost of ground receiving equipment is also much higher. The cost of a receiving station that can fully utilize the high resolution data is one-half a million dollars or more. We have a phase I proposal that would investigate the feasibility of developing a low-cost, direct readout station, for something less than \$100,000.

The high-resolution data has applications well beyond meteorology. For example, it can be used for crop assessment and land-use surveys. There are many other potential applications. Developing countries, especially, could use the high-resolution data, and if they could buy the ground readout stations cheaply certainly would.

So we look forward to the development of a U.S. source for a low-cost, high-resolution readout.

Mr. MAVROULES. That is very good. In the event that the SBIR Program were not to be reauthorized—I doubt that will happen, I think it will be reauthorized, but taking the worst scenario—is there anything in the Federal Government to stimulate this kind of interest? Like the SBIR Program?

Mr. LATKER. I think that that was the direction of our testimony. That is that removal of any of the three elements or the major ele-

ments that act together to create what you see happening here would result basically in not—you would not be getting to the place that you are now.

And in fact, our office is familiar with R&D programs throughout the Government, not only SBIR. And the SBIR Program is being looked at as a model for extension into the other programs and moving some of the principles that you find there into the other programs to make them work as efficiently in delivering the results of their research to the marketplace.

Now, if in fact the model is gone and you move the residual into the rest of the programs, I think the result is rather obvious.

Mr. MAVROULES. I appreciate that. I have no other questions. Gentlemen, thank you very much.

Richard J. Shane, Assistant Administrator, Office of Innovation, Research and Technology, Small Business Administration. Good morning and welcome. If you would like you can introduce your colleagues.

TESTIMONY OF RICHARD J. SHANE, ASSISTANT ADMINISTRATOR, INNOVATION, RESEARCH AND TECHNOLOGY, SMALL BUSINESS ADMINISTRATION, ACCOMPANIED BY JOHN J. SWEENEY, DEPUTY ASSISTANT ADMINISTRATOR, AND GEORGE MORNING, SENIOR PROCUREMENT ANALYST

Mr. SHANE. I will be accompanied by my deputy, Mr. Jack Sweeney, and Mr. George Morning from my procurement staff.

Mr. MAVROULES. Nice to have you.

Mr. SHANE. Mr. Chairman, it is surely a pleasure to appear before you and the subcommittee today to express the administration's thoughts concerning the progress to date and the proposed reauthorization of the Small Business Innovation Development Act of 1982, Public Law 97-219.

At the outset, I would like to express the administration's, and my personal appreciation for the continuing interest and support of the chairman, the subcommittee, and the Committee on Small Business. The implementation and development of the Small Business Innovation Development Act is of mutual gratification in that it has achieved the vast majority of the intended purposes of the legislation. The program successes recorded to date are due to the mutual efforts of the administration, the Small Business Administration, participating agencies and the Congress.

The President signed into law the Small Business Innovation Development Act on July 22, 1982. At that time he expressed his support for the Small Business Innovation Development Act when he said,

Small business is a tonic for what ails this country. By passing and signing this act we are showing our resolve to unleash this most innovative sector. The Small Business Innovation Development Act recognizes that we in Government must work in partnership with small business to ensure that technologies and processes are readily transferred to commercial application.

In order to make his intentions clear to the participating agencies, the President, on Sept. 16, 1982, sent a personal memorandum to the heads of selected executive departments and agencies wherein he stated:

I hope you will give immediate attention to the establishment of your Small Business Innovation Research Program in order to encourage the initiative of the private sector and to use small business as effectively as possible in meeting Federal research and development objectives.

This administration's support was deemed important so that the purposes of the act might be achieved within the sunset provision timeframe. The stated purposes of the act are one, to stimulate technological innovation; two, to use small businesses to meet Federal research and development needs; three, to foster and encourage participation by minority and disadvantaged persons in technology innovation; and last, to increase private sector commercialization innovations derived from Federal research and development.

To ensure continuity of the Small Business Innovation Development Research Program, the President's proposed fiscal 1987 budget recommends the transfer of the Office of Innovation, Research and Technology, to the Department of Commerce.

The Small Business Innovation Research Program is well into its fourth year of performance. The SBA is currently in the process of analyzing fiscal 1985 data from participating agencies. Early returns once again conclusively indicate a sound SBIR Program. SBA monitoring and reviews try to balance the interrelationship between proposals received, dollars expended, technical value, and commercialization.

During fiscal year 1985, the participating agencies received approximately 9,090 proposals and made approximately 1,395 phase 1 and approximately 406 phase 2 awards. On a program cumulative basis, this totals to 25,859 proposals, 3,080 phase 1 awards and 744 phase 2 awards.

It is clear that the number of proposals received is more than adequate and the percent of proposals received to awards made is highly competitive in a procurement environment. Equally important is the general view of the agencies that the technical quality of the innovation remains high.

During fiscal year 1985, the agencies awarded approximately \$200 million in SBIR funding agreements. On a program cumulative basis, the program has now awarded in excess of \$355 million. The awards have gone to 47 States and the District of Columbia and cover all areas of high technology.

[The technical award trend is as follows:]

[By fiscal year, in percent of dollars]

Technology field	Phase 1, 1983-85	Phase 2, 1984-85
1. Computer, information, and analysis.....	19.6	21.0
2. Electronics	17.0	18.0
3. Materials.....	18.0	17.7
4. Mechanical performance of vehicles, weapons, and facilities.....	6.5	6.0
5. Energy conversion and use	11.4	13.0
6. Environment and natural resources.....	7.8	8.0
7. Life sciences.....	19.7	15.0

Mr. SHANE. We are extremely pleased that the innovations are covering the full spectrum of sciences and in a general distribution no single technical area dominates. I feel that this bodes well for the future of American technology in the 1990's.

In fiscal year 1985, SBA began the operation of its commercialization matching system [CMS], which links SBIR awardees with potential sources of capital—venture capitalists, larger corporations. CMS was developed to support a basic aim of the SBIR Program; the conversion of R&D results into commercial applications and products through the use of non-Federal sources of capital. Both SBIR awardees and direct sources of capital are eligible to use the computer search capabilities of CMS to receive information about one another.

CMS also has a keyword search capability to aid in matching the SBIR awardees with potential sources of capital. Every word in the title, abstract, commercial applications, and keyword sections of the technical abstract is indexed.

The data base presently contains information on over 3,200 SBIR projects and 520 sources of capital—evenly divided between venture capital firms and large corporations. To date, CMS has been used by 325 SBIR awardees, 110 large corporations, and 60 venture capital companies. For the most part the response has been enthusiastic and many sources of capital have already asked for additional searches.

While the SBIR Program is not without minor problems, it can be clearly stated at this point that the implementation, agency administration, and technical direction have gone exceptionally well. Small high-technology companies are beginning to develop the innovations that we all anticipated they would.

There is no lack of proposed innovative ideas, and the quality is high.

The first group of phase 2 awardees completed their work this spring. While we are all very enthusiastic about the results, we do not have the depth of quantitative data to make an estimate of commercial potential of the innovations. Because this information is not yet available and the current authorization runs until October 1988, the administration has not proposed reauthorization of the act.

However, the prospect for a successful commercialization phase looks favorable and we recognize that it will take several years to acquire and quantify information on commercialization. Therefore, we would not object to an extension of the sunset date of the act or a reauthorization to permit an orderly operation of the program while the data on phase 3 are being collected and evaluated.

Along with this we also await the General Accounting Office report concerning the judgment of departments and agencies as to the effect of the act on Federal research programs.

Mr. Chairman, I would like to reiterate the administration's total and continued support for the Small Business Innovation Development Act. We all look forward to the final analysis and reporting of the last stated purpose of the act.

This concludes my prepared statement and I will be pleased to answer any questions the committee may have.

[Attachment to testimony follows:]

NUMBER OF SBIR AWARDS BY STATE — FY 1983 • FY 1984 • FY 1985



Mr. MAVROULES. Thank you very much. I just want to ask one question. On page four you did mention the fact that the administration would like to transfer this over to the Department of Commerce. My question is, if this is working under the SBA, why not leave it alone?

Mr. SHANE. It is in anticipation of the acceptance of the administration's pending FY 1987 budget, which is in the Congress being debated and considered. The statement revolves around the point of proposed transfer that was contained in the President's budget submission.

Mr. MAVROULES. OK, I can appreciate that. I find great enthusiasm for the SBIR Program. I understand where the administration is coming from, and I can assure you we are going to try to head them off because I think it is insane to transfer the duties of SBA over to other agencies.

And I think it is ridiculous to even consider a transfer at this point.

You have taken enormous hits financially, as you well know. We have demonstrated a fiscal conservatism on this committee. And if you compare those hits with other agencies we have gone far beyond the call, let me tell you, to try to bring this under control.

I have not heard anyone yet state that the SBIR program is not working. It is very innovative. If we have a genius out there in the field, we are going to find that genius under this kind of program. I just want you to know how I feel. I am sure Mr. Bedell who just walked in here feels the same way.

I do have one or two questions and then I will refer to my colleague. One criticism of the program has been that only small, high technology firms in California and Massachusetts, my home State, benefit from the SBIR Program. Have you found this to be true? How many States have participated in the SBIR Program?

Mr. SHANE. We have constructed a map to depict this, Mr. Chairman. And if you look at the last 3 years, fiscal years 1983, 1984, and 1985, the distribution has spread all the way across the United States, to 47 States and the District of Columbia.

Unfortunately the award numbers aren't large enough for you to see due to your sitting position. But looking across the country we found that there has been dramatic growth in many areas. There have only been three States that have not received awards. Those are Alaska, Montana and Wyoming. And the concentration, although it has been somewhat in California and Massachusetts, is beginning to spread to other States. There are increased awards in Ohio, Pennsylvania, Texas, Florida and Virginia and it is pretty well distributing across the entire Nation.

In the areas of less awards, for example, the farm belt areas, I think this can be understood when we consider the data from the next chart. Because of the size of the agency programs you do have an even technical emphasis in award in 1983, 1984, and 1985.

The five dominant agencies, being the Departments of Defense, HHS, Energy, NSF, and NASA, have a preponderance of the Federal SBIR dollars. This was brought about by the differing extramural budgets of the agencies. Under the law we determine the agency extramural budget and multiply a set percentum there to establish SBIR funds.

This gives an overall effect of smaller SBIR Programs within the Departments of Interior, Commerce, Education, Agriculture, Transportation, NRC, and EPA.

It has been said by some that increases should be made on an across-the-board basis by changing the set percentage system. I think this is an arguable case if you consider the extramural budgets of the lesser agencies. An increase in their percent would be most beneficial to their SBIR programs. I think it is in the structure of the programs, that if I were bidding I would bid where I thought the most money was available. And I think this does reflect in some of the States with less awards.

Mr. MAVROULES. I think the statement at the beginning is correct, that California and Massachusetts enjoy most of it. But others are now catching on, which is a very good sign for the country.

Mr. SHANE. They are clearly catching up.

Mr. MAVROULES. I have one other question. Earlier, the National Science Foundation testified on the interest that had been shown by foreign governments in the SBIR Program. I think they mentioned maybe a half a dozen other countries. Could you expand upon this international dimension of the SBIR Program?

Mr. SHANE. Yes; Mr. Chairman, in the last 3 years the number of visitors we have had at the SBA and at our office has been overwhelming. I asked for an accounting of it at the beginning of this year.

We have had over 179 visitors from 18 foreign countries and we have provided them 38 detailed SBIR briefings. I think it is significant to note that many of the countries are returning year after year. Japan spends about 10 days with me each summer and their knowledge of the program is excellent and there is no question as to their interest.

It is also interesting to note that we have just received a letter from the United Kingdom dated April 30, 1986, providing a news release from the United Kingdom. They have begun their own SBIR Program. They call it the SMART Program. It is directly modeled after our SBIR Program, with a phase I and a phase II. And they are starting their program with 1.25 million pounds.

They had visited us for several years and picked up copies of all of our policy directives, program data and information. So it is quite clear that England thinks we have been successful. And I am sure Japan will start a program within a year.

Mr. MAVROULES. Yes; that was also mentioned to us. That is good. I do have one other question before I refer to my colleague, Mr. Bedell, who I am sure has some questions.

There have been some legitimate questions put forth by some of the members of the subcommittee about the payback for this program. Could you articulate to the best of your knowledge any kind of a payback system for the SBIR Program? I mentioned before that a private/public ratio, with the private side contributing anywhere from five to eight to one, certainly is a payback in itself in the long run. We will be creating new jobs, new technologies and certainly new revenues for the country. That is my opinion.

Do you have anything you can add to that?

Mr. SHANE. I would look at this from several aspects. And I listed some of those in my testimony. I think we should remind

ourselves as a government that when the law was originally considered and passed what were the circumstances at the time. It is easy to forget what was happening at that time.

Congressman LaFalce, in his statement presenting the bill to the House, said we were in a time of economic crisis. Unemployment at that time had reached 10 million. Congressional hearings had brought out that small business was the best reemployer of these people.

He made the comment that our basic industries were collapsing, we were in a technological decline and that America was losing its ability to innovate, and that foreign governments were surpassing us in every aspect of technical growth.

The SBIR Program detractors, in SBIR testimony at that time made it clear that there were no new U.S. sources of high technology and the technical quality of such proposals would be low. There would be a lack of proposals that this was just another social program and the new procurement concepts would not work.

And interestingly enough, that some universities would be forced to close their doors. I can conclusively say that in our opinion after analyzing the program for the last 4 years, none of these predictions of doom have occurred. In fact the reverse has been true in almost every case.

I think the agencies should be given a round of applause and congratulations. They have done a magnificent job. All the agencies, save one, have started a whole new SBIR procurement system, which is working remarkably well.

The technical quality remains very, very high. We are receiving innovations we never dreamed we would receive. The States have moved in and set up their own similar or support type programs. Foreign governments are following our progress with keen interest. The data and patent clauses created for the SBIR Program have become the model for other programs, and we were told 4 years ago that they would never work.

There is clearly a new attitude in all the Federal agencies concerning the program. In fact, some of the Federal agencies originally testified against SBIR. Mr. Chairman you have heard their testimony this week. I think the proposals that are coming in do provide highly innovative technical solutions to the agencies' technical needs.

So, whether it be the Department of Defense, the Department of Transportation, NRC or any SBIR agency there is an immediate payback in innovations. There is also a cross payback in the growth of technical knowledge, between the universities, large business and small business and the potential for commercialization.

In our CMS system, we have more large businesses involved who want to become involved than we have venture capitalists. When these innovations become commercialized, their growth rate will become very, very significant to our economy in the area of employment and taxation.

We had some interesting data developed for us the other day on our computer. It is interesting to note in 1985 in phase I data, in data we collected from the Department of Defense and the Department of Health and Human Services, of awards, in that one year,

to 645 companies. Of these, 368 of the awards, over half of them, were made to companies of less than 10 people. This is exactly what people said could not be done. There was no technical knowledge in this type of company. So I think the payback is many-fold and time will prove this but we should measure our original purposes and intent and avoid the temptation to expand the purposes and intentions.

I think, modestly speaking, that small business is going to put technology back in the front seat of America. We will regain any losses we may have had.

Mr. MAVROULES. Good. Thank you very much. Mr. Bedell.

Mr. BEDELL. I don't have any questions, Mr. Chairman. Except that I do want to commend you for the work you have done in some of these hearings. I am sorry that because of other requirements on our time some of the other members on the committee have not been able to be here as much as we would have liked to have been.

Do I understand correctly that everyone who has testified has testified favorably for the program? I think that speaks very well for the program and very well for the work you are doing.

Mr. MAVROULES. As a matter of fact, I think that many of the people who have testified have a hell of a lot of courage in making some of the statements they made. And I want to commend all of them for that.

Mr. BEDELL. Well, I sure appreciate the work you have done on this, Mr. Chairman. And I commend you for that.

Mr. MAVROULES. Thank you very much gentlemen. We truly appreciate your testimony. The hearing is now closed.

[Whereupon, at 10:00 a.m., the subcommittee was adjourned to reconvene subject to call of the Chair.]



APPENDIX

PREPARED STATEMENT OF NUCLEAR REGULATORY
COMMISSION, SUBMITTED BY CARLTON KAMMERER,
DIRECTOR, OFFICE OF CONGRESSIONAL AFFAIRS

THE NUCLEAR REGULATORY COMMISSION APPRECIATES THIS OPPORTUNITY TO SUBMIT TESTIMONY ON THE NRC'S SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR) IN CONJUNCTION WITH THE SUBCOMMITTEE'S HEARINGS TO CONSIDER REAUTHORIZATION OF THE SMALL BUSINESS INNOVATION DEVELOPMENT ACT (P.L. 97-219).

THE NRC SMALL BUSINESS INNOVATION RESEARCH PROGRAM IS ADMINISTERED BY THE COMMISSION'S OFFICE OF NUCLEAR REGULATORY RESEARCH. IN FY 1984, THE OFFICE'S EXTRAMURAL RESEARCH AND DEVELOPMENT BUDGET WAS \$172,896,000, OF WHICH \$1,037,376 WAS SET ASIDE FOR SMALL BUSINESSES. IN FY 1985, THE TOTAL RESEARCH AND DEVELOPMENT BUDGET DECLINED TO \$132,982,000. THE AMOUNT SET ASIDE FOR SMALL BUSINESSES INCREASED TO \$1,329,820.

THE OFFICE OF NUCLEAR REGULATORY RESEARCH HAS ISSUED ONE SBIR SOLICITATION PER YEAR FOR PHASE I AND PHASE II SINCE THE PROGRAM BEGAN IN 1983. IN FY 1984, 110 PROPOSALS WERE RECEIVED IN RESPONSE TO SBIR SOLICITATIONS IN PHASE I AND SEVEN IN PHASE II. IN 1985, 72 PROPOSALS WERE RECEIVED IN PHASE I AND FIVE IN PHASE II.

IN FY 1984, SIX CONTRACT AWARDS WERE MADE FROM PROPOSALS SUBMITTED IN PHASE I AND FOUR IN PHASE II. THE AVERAGE FUNDING LEVEL OF THE CONTRACT AWARDS MADE WAS \$44,500 FOR PHASE I AND \$219,000 FOR PHASE II.

IN FY 1985, TEN CONTRACT AWARDS WERE MADE FROM PHASE I SUBMISSIONS AND FOUR FROM PHASE II. THE AVERAGE FUNDING LEVEL OF THE CONTRACT AWARDS WAS \$47,500 FOR PHASE I AND \$213,000 FOR PHASE II IN FY 1985.

THE TOTAL AMOUNT OF FUNDS EXPENDED IN BOTH FY 1984 AND FY 1985 WAS \$2,477,177 -- \$1,144,037 IN FY 1984 AND \$1,333,140 IN FY 1985.

THE NRC SMALL BUSINESS INNOVATION RESEARCH PROGRAM IS A SMALL PROGRAM WITH ONLY EIGHT PHASE II CONTRACTS AWARDED TO DATE. OF THE EIGHT SBIR PHASE II CONTRACT AWARDS, WE ARE NOT AWARE OF ANY FOLLOW-ON FUNDING COMMITMENTS. THE FOUR CONTRACTS AWARDED

IN FY 1984 HAVE RECENTLY COMPLETED WORK. THE FY 1985 PHASE II CONTRACTS WILL NOT BE COMPLETED UNTIL LATE 1986 OR 1987.

PRELIMINARY INDICATIONS ARE THAT THE WORK PERFORMED UNDER THE SBIR CONTRACTS IS WORTHWHILE. THE OFFICE OF NUCLEAR REGULATORY RESEARCH PLANS TO MAKE AN EVALUATION OF THE RECENTLY COMPLETED WORK TO DETERMINE THE BENEFIT TO THE RESEARCH PROGRAM AND IS THEREFORE NOT IN A POSITION TO PROVIDE A COMPREHENSIVE ASSESSMENT OF THE PROGRAM AT THIS TIME. THE COMMISSION WILL PROVIDE THE SUBCOMMITTEE WITH A STATEMENT REGARDING ANY BENEFITS OF THE SBIR PROGRAM UPON COMPLETION OF THAT ASSESSMENT.

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